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Annual Report Interim Measures/ Interim Remedial Action for the Industrial Area at the Rocky Flats Environmental Technology Site

March 1996

Annual Report for the Interim Measures/Interim Remedial Action for the Industrial Area at the Rocky Flats Environmental Technology Site

Rocky Mountain Remediation Services, L.L.C.

March 1996

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1. INTRODUCTION

On November 28, 1994, the Final Industrial Area Interim Measures/Interim Remedial Action (IM/IRA) Decision Document (DD) was approved by the U. S. Environmental Protection Agency (EPA) and the Colorado Department of Health and Environment (CDPHE). The Final Industrial Area IM/IRA/DD satisfied the requirements set forth in the Rocky Flats Interagency Agreement (IAG) dated January 22, 1991. For preparation of the Industrial Area IM/IRA/DD, the existing environmental monitoring programs in the Industrial Area were reviewed and evaluated, and proposed actions were developed to enhance current monitoring programs in the Industrial Area for the purpose of detecting potential contaminant releases from current and future transition activities before migrating beyond the Industrial Area fence-line.

The IM/IRA/DD specifies that an annual report describing the status, progress, and performance of the Industrial Area IM/IRA will be developed and submitted to the regulatory agencies. The objectives of this document are to report on:

- the progress and status of program enhancements to the Industrial Areas environmental monitoring system
- verification monitoring activities for the past 12 months, including the following:
  - type of transition activities
  - building or site
  - verification monitoring level or locations
  - action levels
  - response actions
  - verification monitoring results
  - corrective actions
- planned activities for the next 12 months

Since the Industrial Area IM/IRA only began implementation in the spring of 1995, this report will not contain a full years worth of monitoring data.

1.1 Annual Report Format

This report is organized into separate sections representing the monitored media of the industrial area. Section 2. -(SURFACE WATER MONITORING PROGRAM), Section 3 (GROUNDWATER MONITORING Program), and Section 4. -(AIR MONITORING PROGRAM) are all designed to be self contained. These sections contain summaries of data collected to date, monitoring objectives, and preliminary data analysis.

Section 5. (RESPONSE ACTIONS) contains a summary of response actions, and Section 6. (Summary of Future Actions for the Industrial Area IM/IRA) summarizes future activities for the Industrial Area IM/IRA.

Scope of the Industrial Area IM/IRA

The IM/IRA was designed to focus monitoring efforts on the specific activities of the transition programs and develop the flexible coverage necessary to be responsive to the new mission of the Rocky Flats Environmental Technology Site (RFETS). The ultimate objectives are to minimize the spread of contaminants during transition activities by providing early detection of releases, and provide early mitigative responses.

The IA IM/IRA accomplishes these objectives in several ways. By identifying potential source areas and migration pathways from the industrial area, the current monitoring network was upgraded to insure that all industrial area migration pathways are appropriately monitored.

These upgrades include:

- Addition of five air samplers around the perimeter of the industrial area which are being used to establish baseline levels of Volatile Organic Compounds (VOCs), and for monitoring during transition activities.

- Upgrade of five industrial area surface water outfall sites. These upgrades include the addition of VOC monitoring capability, upgrading the flow measuring capabilities and adding telemetry systems to three of the outfalls. These monitoring stations serve the objectives of the IA IM/IRA as well as anticipated requirements of the storm water discharge permit.

- The groundwater monitoring program was augmented to focus on groundwater flowpaths which may reach the surface water at the industrial area perimeter. IM/IRA wells are used as an integral part of the groundwater monitoring system and additional locations are developed in conjunction with the groundwater monitoring program.

- Upgrade of incidental water and foundation drain water monitoring and management.

In addition to upgrading the current monitoring network, specific temporary monitoring was developed to focus on buildings or areas in which transition and clean up activities are likely to cause environmental impacts. Focused monitoring is located close to potential source areas, samples for a very limited analyte suite is portable, and is designed to provide early detection of low level releases from the activity areas. Once an activity is completed, the monitors may be relocated and reconfigured to monitor another activity.

A third way in which the objectives of the IM/IRA are being met is through the development of preprogrammed responses to detected releases. If during a Decontamination and Decommissioning (D&D) activity, an analyte is detected at levels above established baseline conditions, the IM/IRA outlines response actions which include investigation of the potential source, and mitigation if necessary. The response actions are loosely defined to enable flexibility in how low level releases are addressed. The intent of the preprogrammed responses is to insure that some action will be taken, and that an administrative linkage between the monitoring program, and the transition program is established.

2. SURFACE WATER MONITORING PROGRAM

2.1 Introduction

Surface water actions for the Industrial Area IM/IRA were implemented in April 1995. Installation of 13 new or upgraded surface water monitoring stations were completed and made operational. These stations were designed and located, in part, to facilitate the objectives of the Industrial Area IM/IRA. Surface water objectives for this project include:

- Surface water monitoring in areas of concern. Monitoring to date has focused on the terminal ponds and other sites within the Buffer Zone. This focus is being adjusted and expanded to include source areas within the Industrial Area.

- Study surface water quality and hydraulic flow conditions in the Industrial Area to establish baseline conditions.

- Where feasible, implement state of the art monitoring technologies to improve data quality, availability, and reliability. Technical improvements for monitoring building D&D and transition activities will be reviewed regularly in an attempt to improve surface water monitoring capabilities.

- Establish verification monitoring for D&D and Transition activities around buildings or areas that will verify that contaminant pathway protection procedures and site-specific monitoring activities are effective.

- Utilize statistically based methodologies to identify and develop site-specific baseline conditions for environmental media at activity locations and determine when response actions are needed.

The type and extent of verification monitoring will depend on the type of activity being performed and the assessed environmental hazard associated with that activity.

This report provides a summary of:

- Progress, current status, and projected program enhancements for the Industrial Area surface water monitoring system;
- Verification monitoring activities;
- Planned activities for the next year;
- Scheduled update for future transition activities.

This report presents accomplishments to date and the analytical results for Industrial Area IM/IRA surface water samples collected from April 1995 to date. Figure 2-1(RFETS Industrial Area IM/IRA Gaging Station Network: Surface Water Verification Monitoring Locations), shows the location of the Industrial Area IM/IRA surface water monitoring stations. Figure 2-2(RFETS Industrial Area IM/IRA Gaging Station Network: Surface Water Routing Diagram), shows the Industrial Area sub-basins and hydrologic routing. Figure 2-3(RFETS Industrial Area IM/IRA Gaging Station Network: Close-Up of GS27 and GS28) shows a close-up of gauging station GS27 and GS28 which support D&D and Transition operations at Building 889 and the Industrial Area IM/IRA Pilot Project.

2.2 Major Accomplishments

The following major activities occurred during the period from April 1995 to date.

- Seven new gaging and six existing stations were installed or upgraded with new primary flow measurement structures and monitoring equipment during the spring of 1995 to support the IA IM/IRA surface-water monitoring program.

- Stormwater runoff samples were collected at 12 of the 13 IA IM/IRA surface-water monitoring stations for a 15-year precipitation event on May 17, 1995. These samples provide a comprehensive look at IA water-quality during one of the largest flood events on record at the Site.

- Continuous water-quality measurement probes were installed at stations GS27 and GS28 to measure pH and conductivity of runoff from the Building 889 D&D area. These probes were installed in continuous water-feeding sumps that keep the pH probe wet during dry periods. The sumps are called the Water Quality Probe Sump Systems. They are working well and providing reliable data.

- Volatile organic carbon samples were collected automatically in Site stormwater runoff for the first time at Rocky Flats.

- Runoff samples at gaging station GS27, located northwest of the Building 889 D&D pilot project, contained plutonium-239,240 at activities up to 90 pCi/g. Consistent detection of the actinides at GS27 prompted source investigation in the GS27 drainage area, including FIDLER screening and drainage ditch sediment sampling. To date, the GS27 actinide source has not been identified.

- A sample was collected at gaging station GS23 from a 5-hour discharge on August 28, 1995. Significant runoff occurred at GS23 on 8-18-95 after a very intense 0.3" precipitation event. Samples were collected on 8-18-95, but they were not analyzed due to funding constraints. Two more samples were collected at GS23 on 8-28-95 and 12-28-95. All samples had extremely high fecal coliform counts; confirming that the GS23 outfall is connected to the Building 887 septic lift station overflow. The GS23 water is raw sewage, and small quantities of americium-241 were detected in one sample. Administrative controls have been put in place to prevent septic discharges at GS23, and these measures continue to be improved by Site personnel.

2.3 Tier I Monitoring Station Data Summary

2.3.1 Tier 1: Industrial Area Outfalls

The objective of the Tier I Industrial Area gaging stations is to monitor and characterize surface water leaving the Industrial Area and determine if D&D and other transition activities have impacted surface water. These gaging stations monitor six (6) of the seven (7) major pathways discussed in the Industrial Area IM/IRA/DD and 5 culverts on the 881 Hillside.

2.3.2 Gaging Station GS10

Location

- 39° 53' 35.11"N 105° 11' 26.6"W
- South Walnut Creek, above the Pond B-1 Bypass; co-located with SW023

Drainage Characteristics:

- Pathway 2
- Total and Effective Area: 0.281 $mi.^2$ = 179.8 ac (approximately 78% impervious)
- Sub-basins: CSWAB1, CSWAB2, CSWAB3, CSWAB4, CSWAB5, CSWAA2, CSWAA3, CSWAA4, CSWAA5, CSWAA6 (Figure 2-2)
- Description: GS10 lies on South Walnut Creek just above the B-1 Bypass. The basin consists of the central and southern area of the Industrial Area (total of 140 ac 100% impervious).
- Areas draining to this site: 900, 800, 700, 600, 500, 400, 300, 100

Hardware Configuration:

- Primary Device: 9½" Parshall flume
- Flow Meter: ISCO® Model 3230 (bubbler)
- Sampler: ISCO® Model 3700R Refrigerated

  ISCO® Model 6000 VOC
- Radio Telemetry: No
- Power: DC solar power system
- Water Quality Parameters: None

Discharge Data

Table 2-1. GS10 Mean Daily Discharge Data

KEY: Average of Mean Cubic Feet per Second(CFS) = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

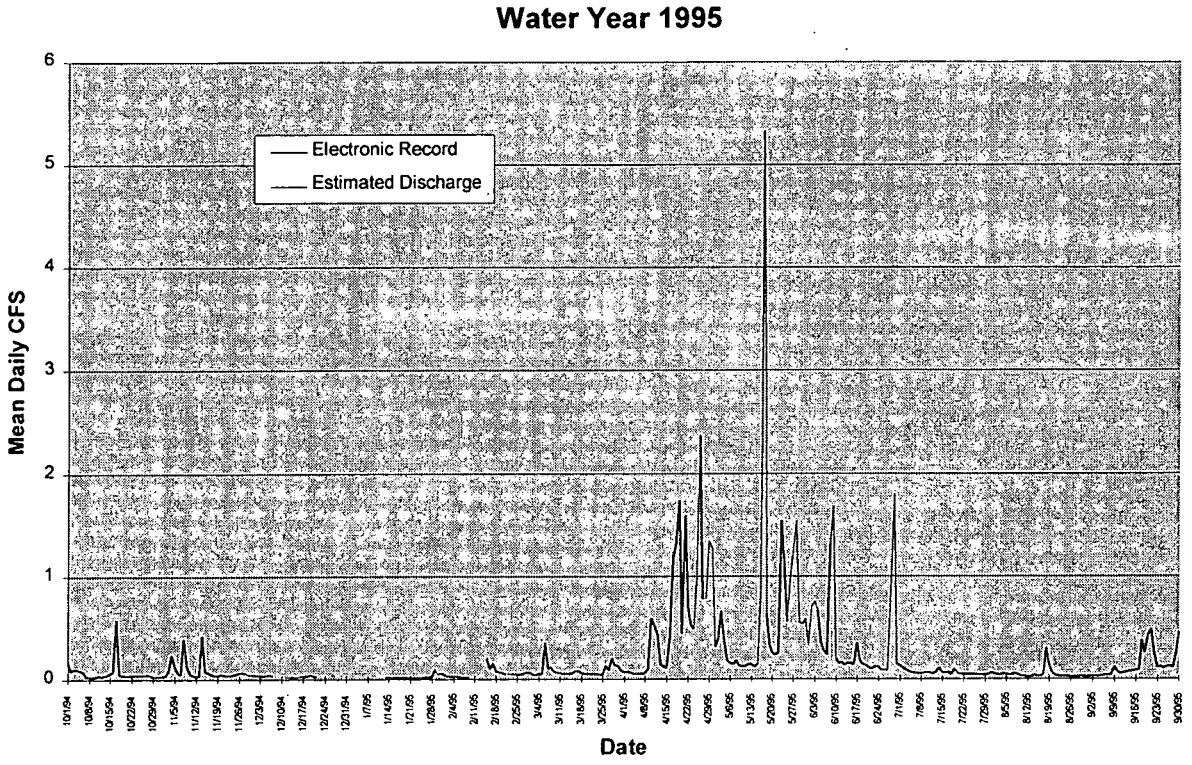
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

GS10					
Year	Month	Average of Mean CFS	Min of Mean CFS	Max of Mean CFS	Days of Record
1994	10	0.069	0.023	0.584	31
	11	0.086	0.033	0.424	30
	12	0.032	0.019	0.046	18
1994 Total		0.067	0.019	0.584	79
1995	1	0.026	0.015	0.097	19
	2	0.058	0.017	0.210	23
	3	0.085	0.041	0.356	31
	4	0.616	0.055	2.366	30
	5	0.644	0.123	5.327	31
	6	0.394	0.085	1.803	30
	7	0.064	0.043	0.134	31
	8	0.047	0.021	0.301	31
	9	0.139	0.024	0.488	30
1995 Total		0.244	0.000	5.327	256
Grand Total		0.202	0.015	5.327	335

Figure 2-4. GS10 Mean Daily Discharge



Gaging Station GS21

Location:

- State Plane: 2083061; 748147
- concrete spillway near intersection of Seventh St. and Cactus Avenue

Drainage Characteristics:

- Pathway 5
- Buildings: T664A, 664
- Sub-basins: DIV3 (Figure 2-2)
- Description: GS21 lies on the concrete spillway near intersection of Seventh St. and Cactus Avenue, at the southwest corner of the 850 parking lot. This basin receives Industrial Area runoff principally from the roads, parking lots and storage area south of Building 664.

Hardware Configuration:

- Primary Device: 4" cutthroat flume (Beta Sue)
- Flow Meter: ISCO® 4230 bubbler
- Sampler: ISCO® 3710 Automatic

  ISCO® 6000 Automatic VOC
- Radio Telemetry: Yes
- Power: DC solar power system
- Precipitation: ISCO® Rain Gage
- Water Quality Parameters: None

Discharge Data

Table 2-2. GS21 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

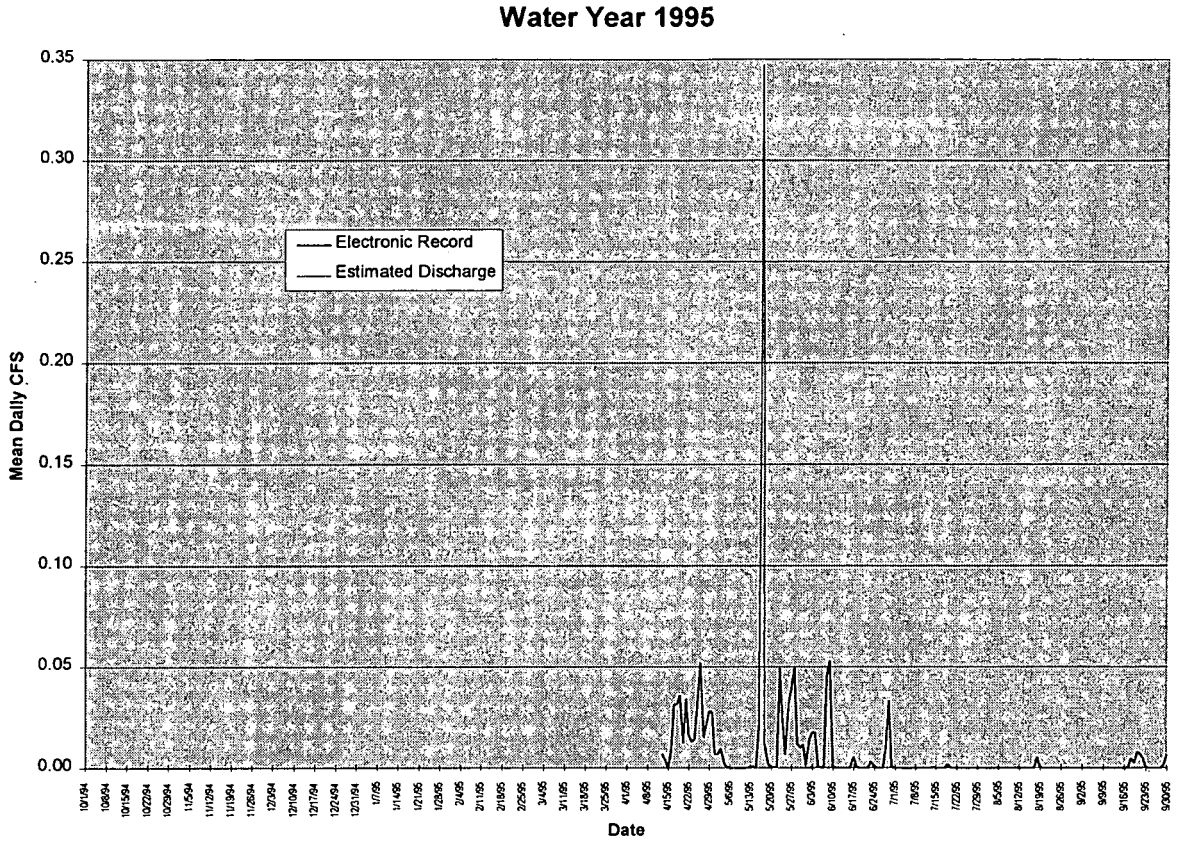
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

GS21					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	No Data	No Data	No Data	0
	11	No Data	No Data	No Data	0
	12	No Data	No Data	No Data	0
1994 Total		No Data	No Data	No Data	0
1995	1	No Data	No Data	No Data	0
	2	No Data	No Data	No Data	0
	3	No Data	No Data	No Data	0
	4	1.17E-05	0.052	0.021	18
	5	0	0.347	0.021	31
	6	0	0.053	0.007	30
	7	0	0.002	0.000	31
	8	0	0.005	0.000	31
	9	0	0.008	0.001	30
1995 Total		0	0.347	0.007	171
Grand Total		0	0.347	0.007	171

Figure 2-5. GS21 Mean Daily Discharge



Gaging Station GS22

Location:

- State Plane: 2082646; 747799
- concrete apron at 400 Area outfall to SID

Drainage Characteristics:

- Pathway 5
- Buildings: T124A, 440, 444, T444A, 447, 451, 457, 460, 461, 462
- Sub-basins: CDIV1 (Figure 2-2)
- Description: GS22 lies at the concrete apron at the 400 Area outfall to the SID. This basin receives Industrial Area runoff principally from the roads, parking lots and buildings of the 400 Area.

Hardware Configuration:

- Primary Device: 1.5 foot H flume
- Flow Meter: ISCO® 4230 bubbler
- Sampler: ISCO® 3710 Automatic

  ISCO® 6000 Automatic VOC
- Radio Telemetry: No
- Power: DC solar power system
- Water Quality Parameters: None

Discharge Data

Table 2-3. GS22 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

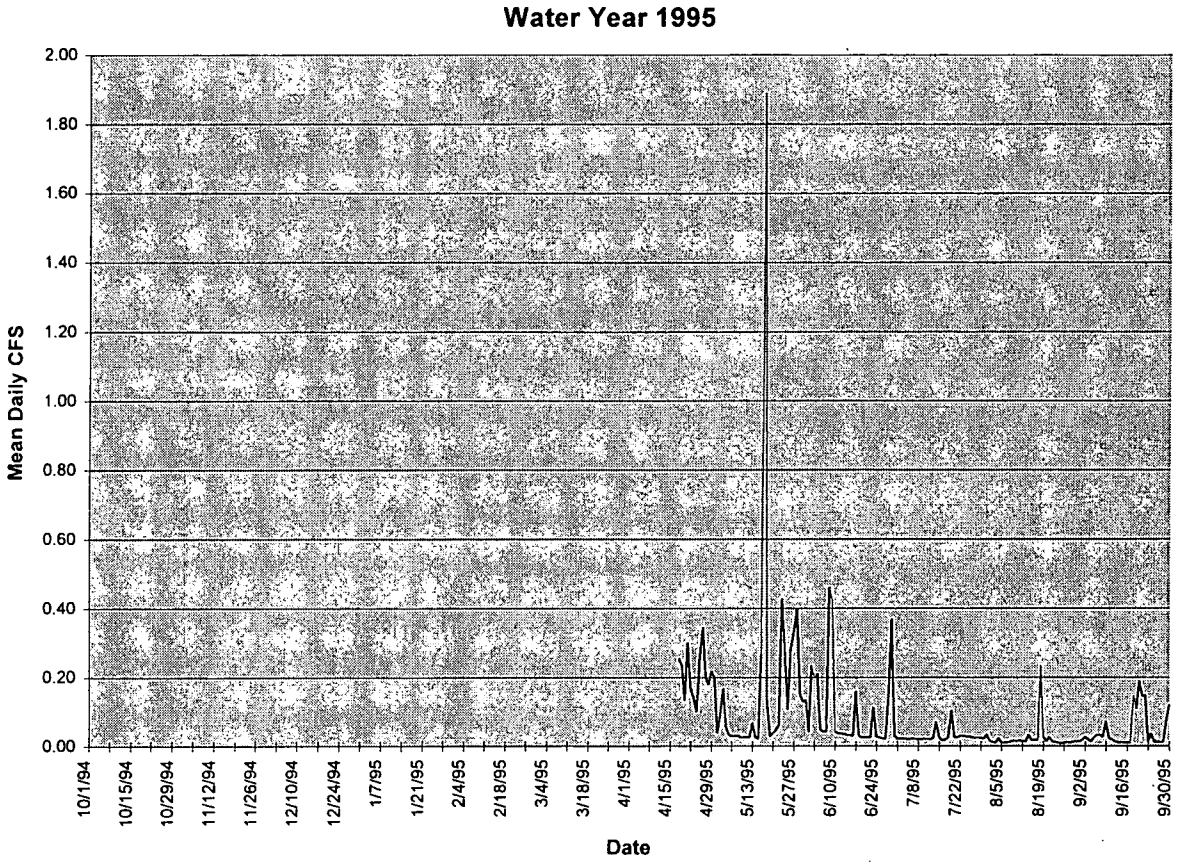
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

GS22					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	No Data	No Data	No Data	0
	11	No Data	No Data	No Data	0
	12	No Data	No Data	No Data	0
1994 Total					0
1995	1	No Data	No Data	No Data	0
	2	No Data	No Data	No Data	0
	3	No Data	No Data	No Data	0
	4	0.100	0.346	0.210	13
	5	0.022	1.889	0.174	31
	6	0.022	0.460	0.100	30
	7	0.017	0.104	0.028	31
	8	0.009	0.233	0.023	31
	9	0.011	0.189	0.048	30
1995 Total		0.000	1.889	0.085	166
Grand Total		0.000	1.889	0.085	166

Figure 2-6. GS22 Mean Daily Discharge



Gaging Station GS23

Location:

- State Plane: 2083781; 747885
- Building 881 septic lift overflow outfall south of 881

Drainage Characteristics:

- Pathway 5
- Buildings: 881
- Sub-basins: no known surface water contributions; potential infiltration to outfall pipe (Figure 2-2)
- Description: GS23 monitors a 5.5" metal pipe which outfalls on the hillside south of the southwest corner of Building 881. The pipe is the outfall for the overflow from the Bldg. 881 septic lift station. The sources of any surface water seen at this site are unknown.

Hardware Configuration:

- Primary Device: .6 foot HS flume
- Flow Meter: ISCO® 4230 bubbler
- Sampler: ISCO® 3710 Automatic

  ISCO® 6000 Automatic VOC
- Radio Telemetry: Yes
- Power: DC solar power system
- Water Quality Parameters: None

Discharge Data

Table 2-4. GS23 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

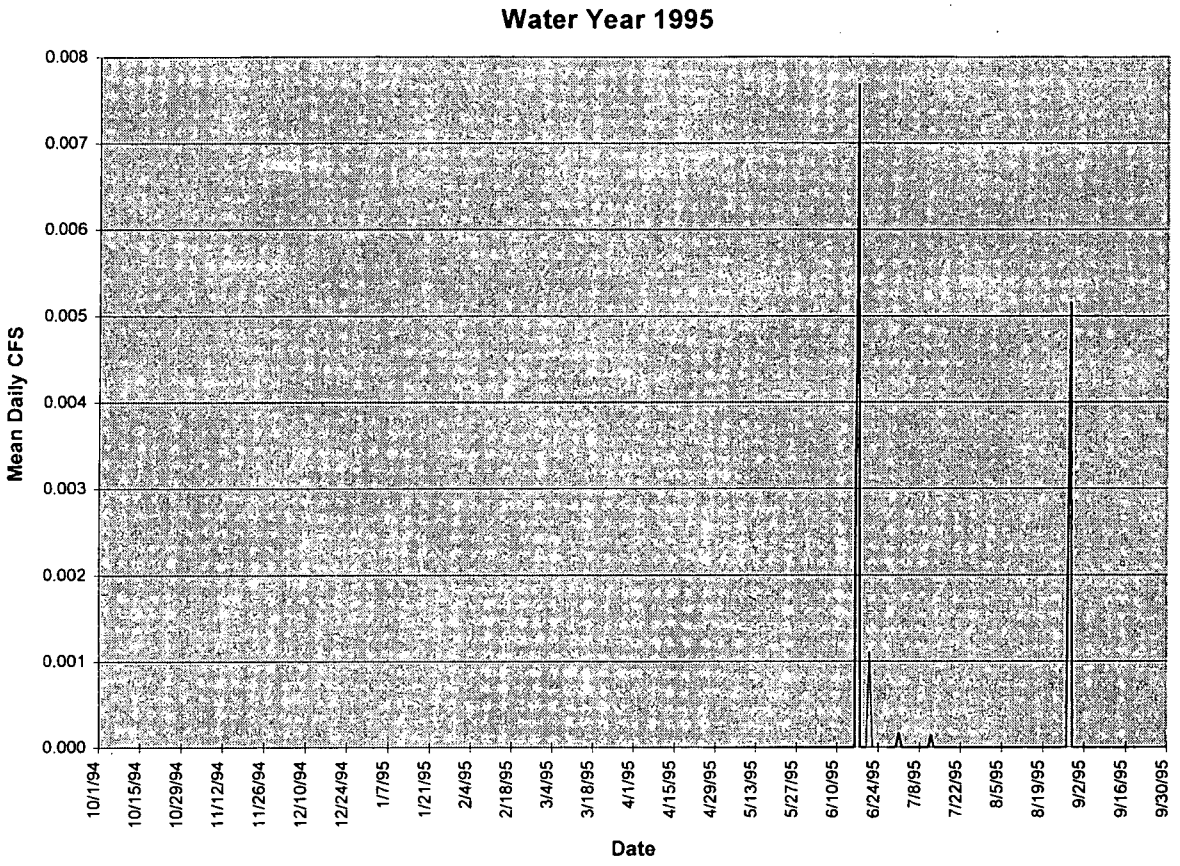
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

GS23					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	No Data	No Data	No Data	0
	11	No Data	No Data	No Data	0
	12	No Data	No Data	No Data	0
1994 Total					0
1995	1	No Data	No Data	No Data	0
	2	No Data	No Data	No Data	0
	3	No Data	No Data	No Data	0
	4	No Data	No Data	No Data	6
	5	No Data	No Data	No Data	31
	6	0.000	0.0077	0.0003	30
	7	0.000	0.0002	0.0000	31
	8	0.000	0.0052	0.0002	31
	9	0.000	0.000	0.000	30
1995 Total		0.000	0.0077	0.0001	159
Grand Total		0.000	0.0077	0.0001	159

Figure 2-7. GS23 Mean Daily Discharge



Gaging Station GS24

Location:

- State Plane: 2083973; 747999
- 12" corrugated metal pipe (cmp) south of 881

Drainage Characteristics:

- Pathway 5
- Buildings: 869, 881, T881G, 887, 885
- Sub-basins: DIV3 (Figure 2-2)
- Description: GS24 monitors a 12" cmp which outfalls on the hillside south of Building 881. Surface water originates as runoff from the areas south and west of Building 881.

Hardware Configuration:

- Primary Device: 0.5' H flume
- Flow Meter: ISCO® 4230 bubbler
- Sampler: ISCO® 3710 Automatic

  ISCO® 6000 Automatic VOC
- Radio Telemetry: No
- Power: DC solar power system
- Water Quality Parameters: None

Discharge Data

Table 2-5. GS24 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

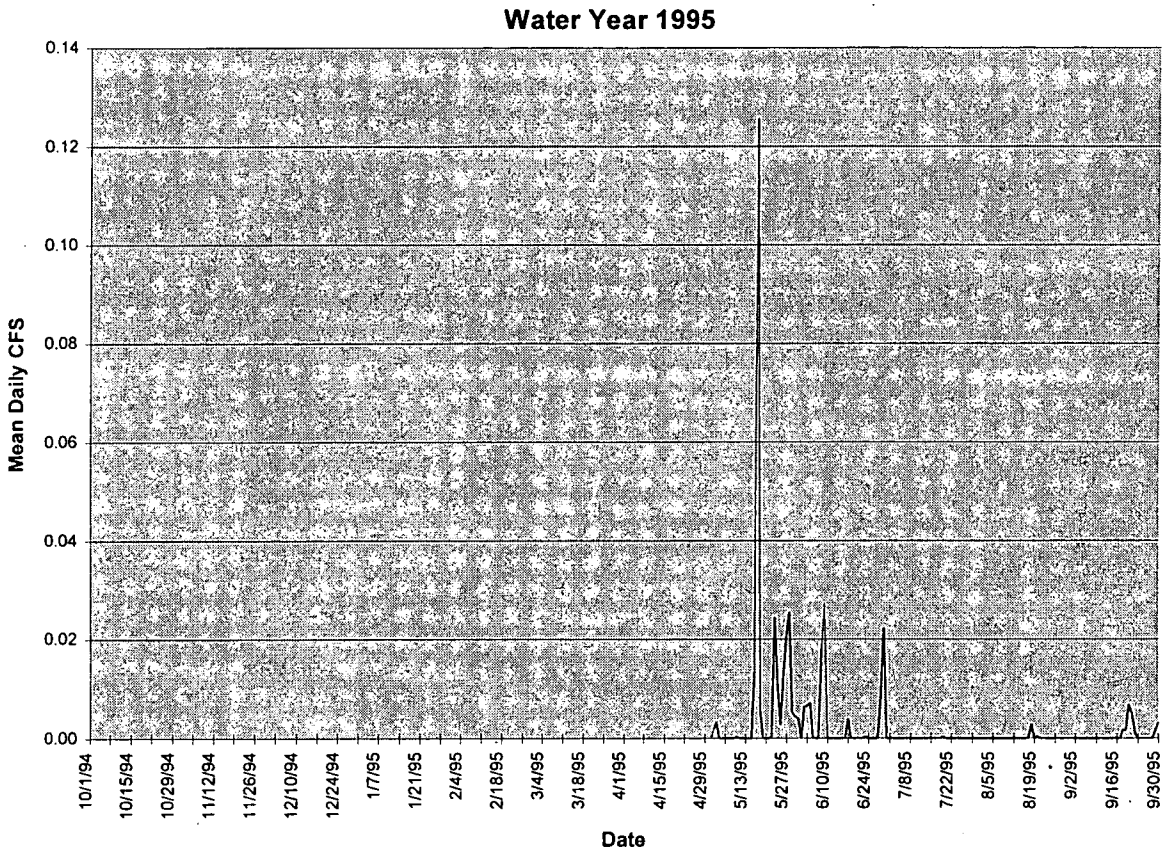
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

GS24					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	No Data	No Data	No Data	0
	11	No Data	No Data	No Data	0
	12	No Data	No Data	No Data	0
1994 Total		No Data	No Data	No Data	0
1995	1	No Data	No Data	No Data	0
	2	No Data	No Data	No Data	0
	3	No Data	No Data	No Data	0
	4	No Data	No Data	No Data	0
	5	0.000	0.126	0.008	31
	6	0.000	0.027	0.003	30
	7	0.000	0.000	1.40E-05	31
	8	0.000	0.003	1.08E-04	31
	9	0.000	0.007	0.001	30
1995 Total		0.000	0.126	0.003	153
Grand Total		0.000	0.126	0.003	153

Figure 2-8. GS24 Mean Daily Discharge



Gaging Station GS25

Location:

- State Plane: 2084114; 747891
- 18.5" cmp southeast of 881

Drainage Characteristics:

- Pathway 5
- Buildings: 883, T883, T881A, -B, 890, 881, 881F, 882, 830, T881G, 887, 885
- Sub-basins: DIV3 (Figure 2-2)
- Description: GS25 monitors a 18.5" cmp which outfalls on the hillside southeast of Building 881. Surface water at this site originates as runoff from the areas east, north, and northeast of 881.

Hardware Configuration:

- Primary Device: 1 foot H flume
- Flow Meter: ISCO® 4230 bubbler
- Sampler: ISCO® 3710 Automatic

  ISCO® 6000 Automatic VOC
- Radio Telemetry: No
- Power: DC solar power system
- Water Quality Parameters: None

Discharge Data

Table 2-6. GS25 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

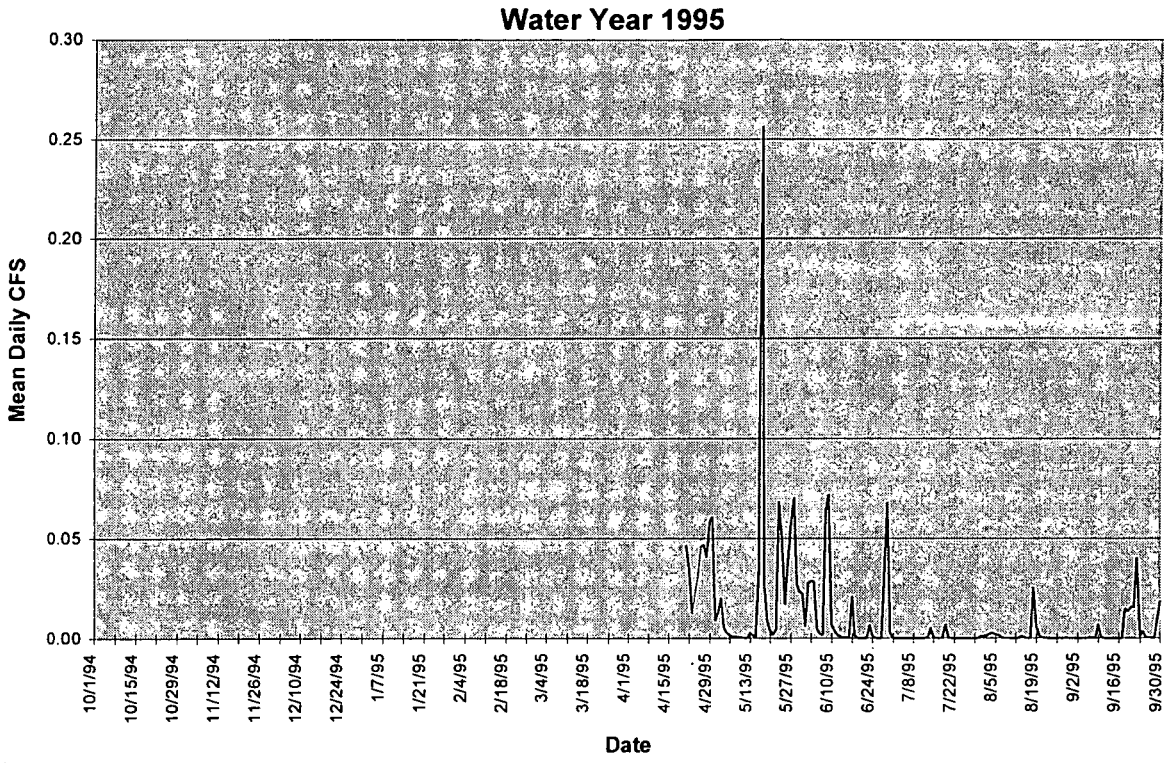
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

GS25					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	No Data	No Data	No Data	0
	11	No Data	No Data	No Data	0
	12	No Data	No Data	No Data	0
1994 Total		No Data	No Data	No Data	0
1995	1	No Data	No Data	No Data	0
	2	No Data	No Data	No Data	0
	3	No Data	No Data	No Data	0
	4	0.012	0.061	0.040	10
	5	7.09377E-05	0.257	0.025	31
	6	7.0252E-05	0.072	0.013	30
	7	3.06425E-05	0.007	0.001	31
	8	0	0.025	0.002	31
	9	0	0.040	0.005	30
1995 Total		0	0.257	0.011	163
Grand Total		0	0.257	0.011	163

Figure 2-9. GS25 Mean Daily Discharge



Gaging Station SW022

- State Plane: 2086443.2; 749757.8
- Central Avenue Ditch at the splitter box near T903A, Inner East Gate

Drainage Characteristics:

- Pathway 1
- Total and Effective Area: 0.132 $mi.^2$ = 84.5 ac (approximately 75% impervious)
- Sub-basins: CSWAA2, CSWAA3, CSWAA4, CSWAA5, CSWAA6 (Figure 2-2)
- Description: SW022 lies on the Central Avenue Ditch at the splitter box near T903A, Inner East Gate. The basin consists of the southern area of the Industrial Area.
- Areas draining to this site: 900, 800, 600, 400, 300, 100

Hardware Configuration:

- Primary Device: 9 ½" Parshall flume
- Flow Meter: ISCO® Model 4230 (bubbler)
- Sampler: ISCO® Model 3700R Refrigerated

  ISCO® Model 6000 Automatic VOC
- Radio Telemetry: Yes
- Precipitation: ISCO® Rain Gage
- Power: DC solar power system
- Water Quality Parameters: None

Discharge Data

Table 2-7. SW022 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

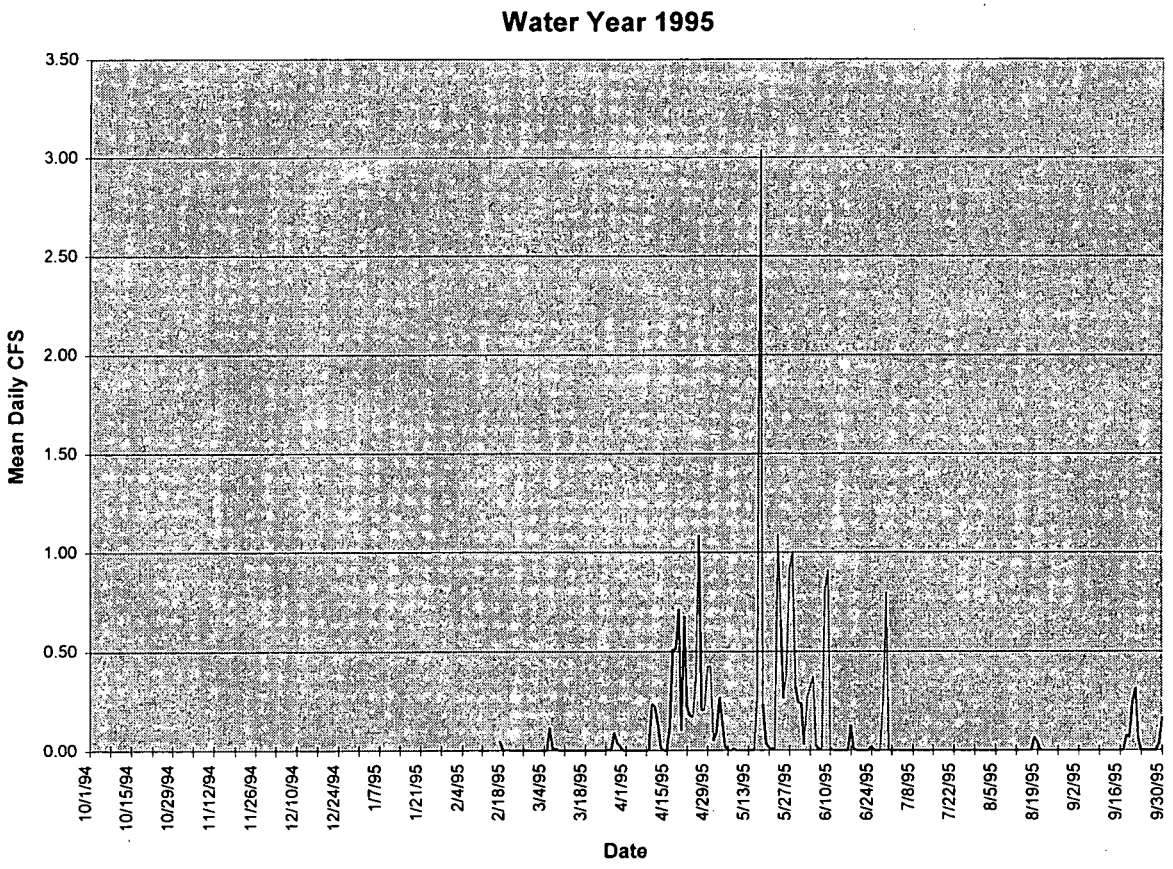
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

SW022					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	No Data	No Data	No Data	0
	11	No Data	No Data	No Data	0
	12	No Data	No Data	No Data	0
1994 Total		No Data	No Data	No Data	0
1995	1	No Data	No Data	No Data	0
	2	0	0.049	0.002	24
	3	0	0.118	0.010	31
	4	0	1.086	0.217	30
	5	0	3.035	0.301	31
	6	0	0.912	0.133	30
	7	0	0.000	0.000	31
	8	0	0.069	0.003	31
	9	0	0.316	0.032	30
1995 Total		0	3.035	0.089	238
Grand Total		0	3.035	0.089	238

Figure 2-10. SW022 Mean Daily Discharge



Gaging Station SW027

Location:

- 39° 53' 11.5"N 105° 11' 4.3"W
- SID Culvert Number 4; outlet of SID to Pond C-2 prior to crossing under Woman Creek

Drainage Characteristics:

- Pathway 5
- Area: 0.29 $mi.^2$ = 185.6 ac (approximately 15% impervious)
- Sub-basins: DIV2, DIV3, CDIV1 (Figure 2-2)
- Description: SW027 lies on the South Interceptor Ditch at the upstream end of dual 66" cmps which convey SID water under Woman Creek and into Pond C-2. The basin consists of the sloping, vegetated area immediately south of the Industrial Area. This basin receives Industrial Area runoff primarily from the 800 and 400 Areas.

Hardware Configuration:

- Primary Device: Dual 120° V-notch weirs
- Flow Meter: ISCO® Model 3230 (bubbler)
- Sampler: ISCO® Model 3700R Refrigerated

  ISCO® Model 6000 VOC
- Radio Telemetry: No
- Power: DC solar power system
- Water Quality Parameters: None

Discharge Data

Table 2-8. SW027 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

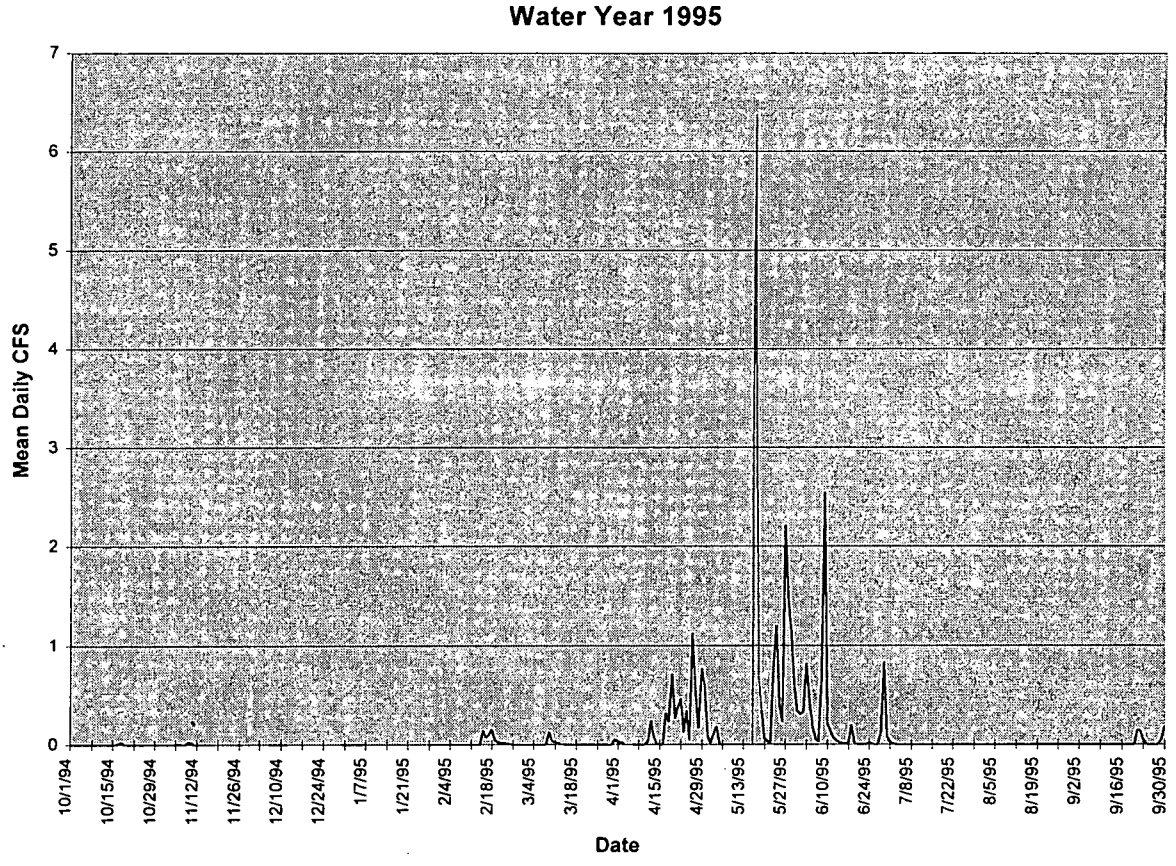
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

SW027					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	0	0.024	0.001	31
	11	0	0.027	0.002	30
	12	0	0.000	0.000	22
1994 Total		0	0.027	0.001	83
1995	1	0	0.000	0.000	21
	2	0	0.157	0.022	28
	3	0	0.131	0.009	31
	4	0	1.126	0.235	28
	5	0	6.373	0.528	31
	6	0.002	2.550	0.241	30
	7	0	0.028	0.002	31
	8	0	0.000	0.000	31
	9	0	0.179	0.020	30
1995 Total		0	6.373	0.122	261
Grand Total		0	6.373	0.093	344

Figure 2-11. SW027 Mean Daily Discharge



Gaging Station SW091

- State Plane: 2086064; 751322
- small tributary of North Walnut Creek, which drains the northeast corner of Industrial Area near the Solar Ponds

Drainage Characteristics:

- Pathway 6
- Area: 0.019 $mi.^2$ = 12.2 ac (approximately 45% impervious)
- Sub-basins: CWAB1, CWAB2, portion of WA11 (Figure 2-2)
- Description: SW091 lies on a small tributary of North Walnut Creek, which drains the northeast corner of Industrial Area near the Solar Ponds. The basin consists of 10.9 acres of the Industrial Area. This basin receives Industrial Area runoff primarily from the open area immediately east of the Solar Ponds.

Hardware Configuration:

- Primary Device: 1' H Flume
- Flow Meter: ISCO® Model 4230 (bubbler)
- Sampler: ISCO® Model 3710 Automatic

  ISCO® Model 6000 Automatic VOC
- Radio Telemetry: No
- Precipitation: ISCO® Rain Gage
- Power: DC solar power system
- Water Quality Parameters: None

Discharge Data

Table 2-9. SW091 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

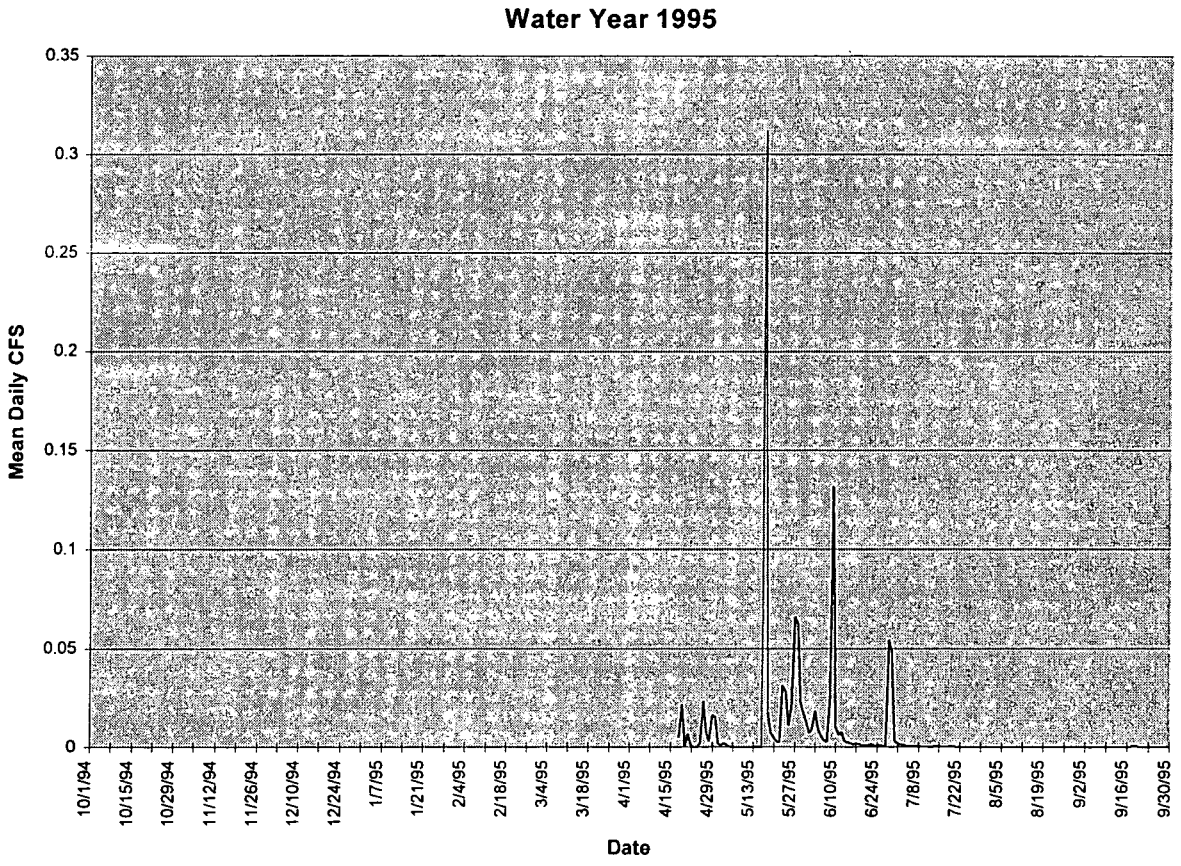
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

SW091					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	No Data	No Data	No Data	0
	11	No Data	No Data	No Data	0
	12	No Data	No Data	No Data	0
1994 Total		No Data	No Data	No Data	0
1995	1	No Data	No Data	No Data	0
	2	No Data	No Data	No Data	0
	3	No Data	No Data	No Data	0
	4	0	0.023	0.008	13
	5	0	0.312	0.020	31
	6	0.0003	0.132	0.012	30
	7	0	0.002	0.000	31
	8	0	0.000	0.000	31
	9	0	0.001	0.000	30
1995 Total		0	0.312	0.007	166
Grand Total		0	0.312	0.007	166

Figure 2-12. SW091 Mean Daily Discharge



Gaging Station SW093

Location:

- State Plane: 2085008.5; 751710.2
- North Walnut Creek below 6' cmp draining Industrial Area; directly north of Solar Pond C

Drainage Characteristics:

- Pathway 3
- Area: 0.362 $mi.^2$ = 231.7 ac (approximately 46% impervious)
- Sub-basins: WA12a, WA13, WA14, CWAA1, CWAC6, CWAC5, CWAC2, CWAC4, CWAC3, CWAC10, CWAC13, CWAC11, CWAC1, CWAC12, CWADIV2b (Figure 2-2)
- Description: SW093 lies on North Walnut Creek, which drains the north and northwest areas of Industrial Area. The basin consists of 150.4 acres of the Industrial Area. This basin receives Industrial Area runoff from the 700, 500, 300, and 100 Areas.

Hardware Configuration:

- Primary Device: 36" Parshall Flume w/ a 36" Rectangular Weir
- Flow Meter: ISCO® Model 3230 (bubbler)
- Sampler: ISCO® Model 3700R Refrigerated

  ISCO® Model 6000 VOC
- Radio Telemetry: Yes
- Power: DC solar power system
- Water Quality Parameters: None

Discharge Data

Table 2-10. SW093 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

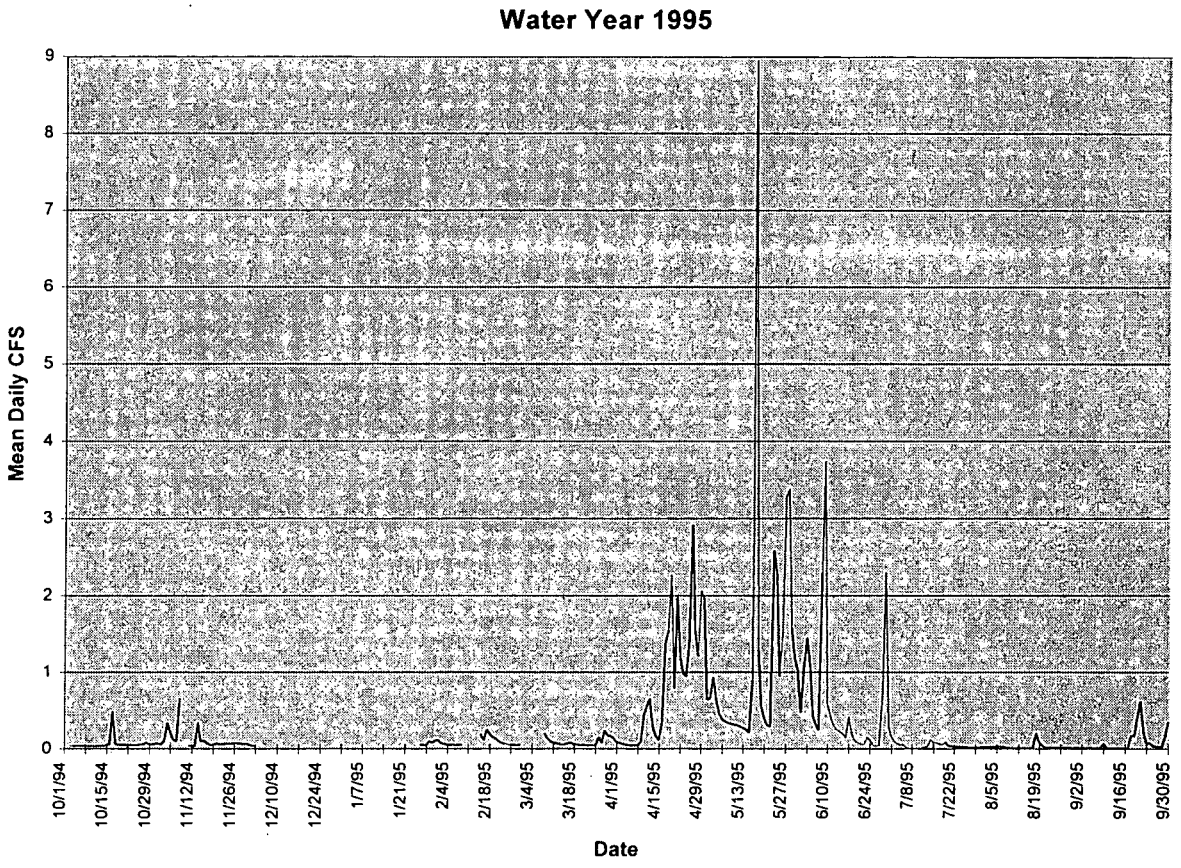
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

SW093					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	0.037	0.487	0.067	29
	11	0.032	0.659	0.119	28
	12	0.030	0.051	0.042	4
1994 Total		0.000	0.659	0.089	61
1995	1	0.052	0.120	0.078	6
	2	0.051	0.257	0.096	23
	3	0.045	0.244	0.098	24
	4	0.047	2.924	0.844	30
	5	0.215	8.960	1.191	31
	6	0.042	3.742	0.596	30
	7	0.007	0.161	0.046	31
	8	0.009	0.208	0.029	31
	9	0.009	0.630	0.091	30
1995 Total		0.000	8.960	0.382	236
Grand Total		0.000	8.960	0.322	297

Figure 2-13. SW093 Mean Daily Discharge



Gaging Station SW998

Location:

- State Plane: 2080607.8; 749862.5
- West Diversion Ditch north of 130 buildings

Drainage Characteristics:

- Pathway 4
- Area: 0.069 $mi.^2$ = 44.2 ac (approximately 90% impervious)
- Sub-basins: CWADIV1, CWADIV2a, WADIV2b (Figure 2-2)
- Description: SW998 lies on the West Diversion Ditch north of the 130 area. This basin receives Industrial Area runoff from the 130 areas only.

Hardware Configuration:

- Primary Device: 9.5" Parshall Flume
- Flow Meter: ISCO® Model 3230 (bubbler)
- Sampler: ISCO® Model 3700 Portable

  ISCO® Model 6000 VOC
- Radio Telemetry: No
- Power: AC line power; DC battery backup
- Water Quality Parameters: None

Discharge Data

Table 2-11. SW998 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

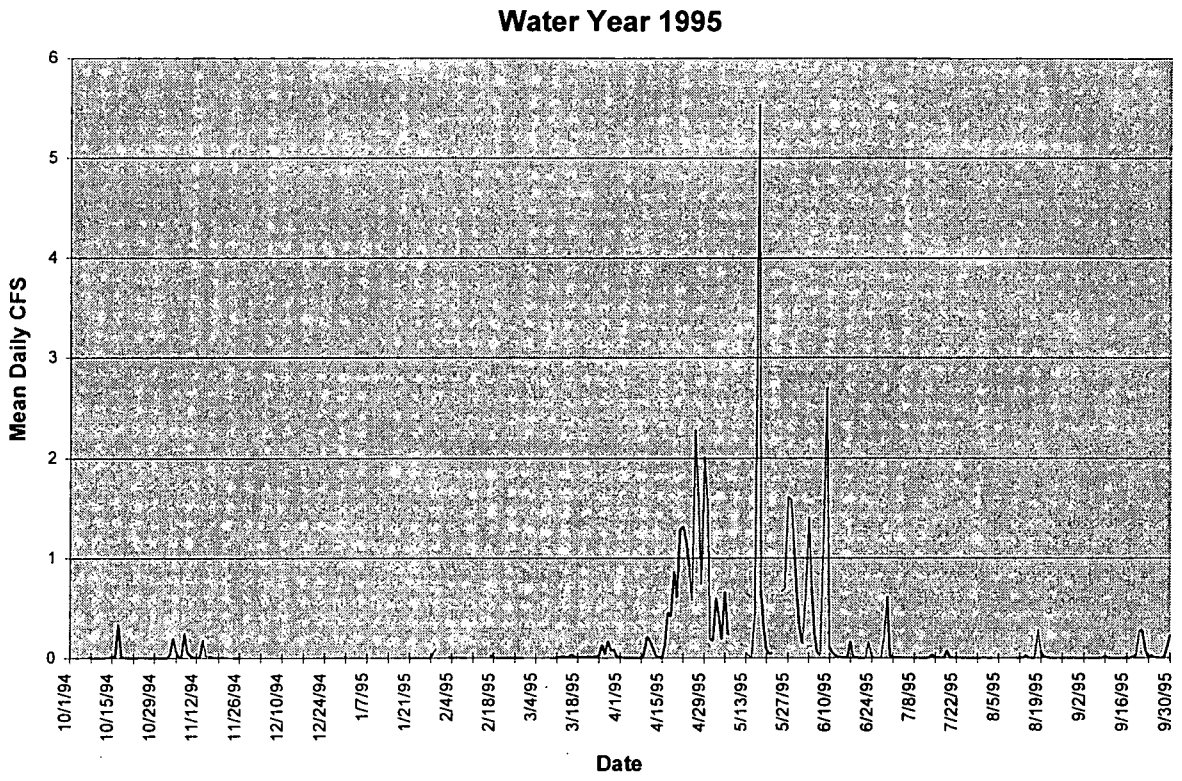
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

SW998					
Year	Month	Min of Mean CF	Max of Mean CFS	Average of Mean	Days of Record
1994	10	0.002	0.339	0.018	27
	11	0.000	0.258	0.039	26
	12	No Data	No Data	No Data	0
1994 Total		0.000	0.339	0.028	53
1995	1	0.000	0.097	0.011	13
	2	0.000	0.034	0.004	19
	3	0.001	0.173	0.032	24
	4	0.001	2.282	0.549	30
	5	0.007	5.544	0.679	24
	6	0.002	2.702	0.290	30
	7	0.001	0.074	0.007	31
	8	0.000	0.286	0.017	24
	9	0.000	0.283	0.037	30
1995 Total		0.000	5.544	0.197	225
Grand Total		0.000	5.544	0.164	278

Figure 2-14. SW998 Mean Daily Discharge



2.3.3 Tier I Water-Quality Data

The Tier I water-quality data are for stormwater runoff samples collected at gaging stations GS10, GS21, GS22, GS24, GS25, SW022, SW027, SW091, SW093, and SW998, and for Building 887 Lift Station discharges at station GS23. Isotopic radiochemistry data were obtained by alpha spectrometry. Gross alpha and Gross Beta activity data were obtained by scintillation counting. Total metals data were obtained by inductively coupled plasma mass spectrometry. Water quality parameter data were obtained by SW846 methods. Volatile organic analyte data were obtained by EPA Method 524.2.

Table 2-12 Tier I Stations Analytical Results (Am 241 & Pu 239,240)

				AMERICIUM-241		PLUTONIUM-239,240	
LOCATION	**SAMPLE#**	**DATE**	**PROJECT**	**Result**	**Error**	**Result**	**Error**
				PCI/L	PCI/L	PCI/L	PCI/L
GS10	SW00301EG	4/26/95	IA_IM/IRA	0.244	0.057	0.269	0.02
GS10	SW00316EG	5/16/95	IA_IM/IRA	0.109	0.012	0.051	0.008
GS10	SW00324EG	5/26/95	IA_IM/IRA	0.073	0.009	0.073	0.008
GS10	SW00334EG	6/28/95	IA_IM/IRA	0.495	0.063	0.436	0.025
GS10	SW00349EG	10/22/95	IA_IM/IRA	0.101	0.012	0.001	0.002
GS10	SW00539GS	10/17/94	SW_EVENT	0.093	0.015	0.11	0.016
GS10	SW00542GS	10/17/94	SW_EVENT	0.055	0.012	0.078	0.016
GS21	SW00308EG	5/3/95	IA_IM/IRA	0.013	0.006	0.104	0.014
GS21	SW00313EG	5/16/95	IA_IM/IRA	0.062	0.009	0.031	0.006
GS21	SW00339EG	6/28/95	IA_IM/IRA	0.021	0.005	0.045	0.007
GS21	SW00307EG	5/3/95	IA_IM/IRA	0.018	0.008	0.007	0.005
GS21	SW00314EG	5/16/95	IA_IM/IRA	0.065	0.011	0.027	0.006
GS21	SW00340EG	6/28/95	IA_IM/IRA	0.009	0.003	0.008	0.003
GS23	SW00331EG	6/17/95	IA_IM/IRA	0.005	0.003	0.013	0.004
GS23	SW00346EG	8/28/95	IA_IM/IRA	0.056	0.010	0.006	0.004
GS24	SW00306EG	5/2/95	IA_IM/IRA	0.040	0.011	0.128	0.014
GS24	SW00341EG	6/28/95	IA_IM/IRA	0.048	0.015	0.209	0.016
GS24	SW00348EG	10/22/95	IA_IM/IRA	0.008	0.003	0.006	0.002
GS25	SW00305EG	5/2/95	IA_IM/IRA	0.012	0.003	0.036	0.006
GS25	SW00317EG	5/16/95	IA_IM/IRA	0.006	0.002	0.02	0.004
GS25	SW00342EG	6/28/95	IA_IM/IRA	0.029	0.007	0.037	0.006
GS25	SW00353EG	10/23/95	IA_IM/IRA	0.002	0.002	0.003	0.002
SW022	SW00304EG	5/2/95	IA_IM/IRA	0.022	0.006	0.067	0.009
SW022	SW00311EG	5/16/95	IA_IM/IRA	0.029	0.008	0.076	0.009
SW022	SW00337EG	6/28/95	IA_IM/IRA	0.185	0.027	0.698	0.036
SW022	SW00350EG	10/23/95	IA_IM/IRA	0.008	0.003	0.002	0.001
SW027	SW00312EG	5/17/95	IA_IM/IRA	0.119	0.014	0.267	0.018
SW027	SW00325EG	5/27/95	IA_IM/IRA	0.374	0.029	2.136	0.085
SW027	SW00338EG	6/28/95	IA_IM/IRA	0.300	0.023	2.289	0.09
SW091	SW00320EG	5/17/95	IA_IM/IRA	0.248	0.021	0.401	0.024
SW091	SW00322EG	5/26/95	IA_IM/IRA	0.999	0.114	0.836	0.045
SW091	SW00343EG	6/27/95	IA_IM/IRA	2.240	0.546	1.616	0.076
SW093	SW00302EG	4/26/95	IA_IM/IRA	0.250	0.043	0.158	0.014
SW093	SW00310EG	5/16/95	IA_IM/IRA	0.131	0.024	0.007	0.003
SW093	SW00323EG	5/26/95	IA_IM/IRA	0.108	0.012	0.116	0.012
SW093	SW00335EG	6/28/95	IA_IM/IRA	1.621	0.221	1.775	0.075
SW998	SW00538GS	10/15/94	SW_EVENT	0.000	0.003	0	0.003
SW998	SW00309EG	5/3/95	IA_IM/IRA	0.009	0.004	0.0085	0.005
SW998	SW00315EG	5/16/95	IA_IM/IRA	0.005	0.002	0.017	0.004

Table 2-13 Tier I Stations Analytical Results (U-233,234 & U-235, U-238)

				URANIUM-233,234		URANIUM-235		URANIUM-238	
LOCATION	**SAMPLE#**	**DATE**	**PROJECT**	**Result**	**Error**	**Result**	**Error**	**Result**	**Error**
				PCI/L	PCI/L	PCI/L	PCI/L	PCI/L	PCI/L
GS10	SW00301EG	4/26/95	IA_IM/IRA	1.471	0.07	0.072	0.011	0.76	0.044
GS10	SW00316EG	5/16/95	IA_IM/IRA	0.682	0.004	0.021	0.006	0.598	0.035
GS10	SW00324EG	5/26/95	IA_IM/IRA	0.952	0.054	0.039	0.009	0.905	0.052
GS10	SW00334EG	6/28/95	IA_IM/IRA	1.958	0.076	0.052	0.008	1.722	0.068
GS10	SW00349EG	10/22/95	IA_IM/IRA	0.663	0.044	0.014	0.007	0.661	0.044
GS10	SW00539GS	10/17/94	SW_EVENT	2.30	0.50	0.140	0.110	1.5	0.39
GS10	SW00542GS	10/17/94	SW_EVENT	0.39	0.2	0.047	0.094	0.29	0.16
GS21	SW00308EG	5/3/95	IA_IM/IRA	0.129	0.019	0.011	0.006	0.112	0.018
GS21	SW00313EG	5/16/95	IA_IM/IRA	0.363	0.026	0.009	0.004	0.486	0.031
GS21	SW00339EG	6/28/95	IA_IM/IRA	0.269	0.021	0.01	0.004	0.17	0.016
GS21	SW00307EG	5/3/95	IA_IM/IRA	0.718	0.054	0.025	0.009	0.67	0.052
GS21	SW00314EG	5/16/95	IA_IM/IRA	0.198	0.018	0.006	0.003	0.172	0.016
GS21	SW00340EG	6/28/95	IA_IM/IRA	0.325	0.024	0.01	0.004	0.261	0.021
GS23	SW00331EG	6/17/95	IA_IM/IRA	2.599	0.108	0.083	0.012	0.963	0.051
GS23	SW00346EG	8/28/95	IA_IM/IRA	0.921	0.052	0.028	0.007	0.133	0.017
GS24	SW00306EG	5/2/95	IA_IM/IRA	1.952	0.112	0.065	0.015	0.683	0.054
GS24	SW00341EG	6/28/95	IA_IM/IRA	1.138	0.056	0.039	0.008	0.623	0.037
GS24	SW00348EG	10/22/95	IA_IM/IRA	0.665	0.037	0.018	0.005	0.206	0.019
GS25	SW00305EG	5/2/95	IA_IM/IRA	3.50	0.10	0.107	0.012	1.70	0.10
GS25	SW00317EG	5/16/95	IA_IM/IRA	1.053	0.051	0.03	0.007	0.614	0.035
GS25	SW00342EG	6/28/95	IA_IM/IRA	0.481	0.029	0.017	0.005	0.254	0.02
GS25	SW00353EG	10/23/95	IA_IM/IRA	0.345	0.024	0.016	0.005	0.168	0.016
SW022	SW00304EG	5/2/95	IA_IM/IRA	0.717	0.036	0.014	0.004	0.5	0.029
SW022	SW00311EG	5/16/95	IA_IM/IRA	0.432	0.031	0.015	0.005	0.403	0.03
SW022	SW00337EG	6/28/95	IA_IM/IRA	0.832	0.042	0.028	0.006	0.494	0.03
SW022	SW00350EG	10/23/95	IA_IM/IRA	0.264	0.021	0.006	0.003	0.226	0.019
SW027	SW00312EG	5/17/95	IA_IM/IRA	0.787	0.048	0.027	0.007	0.858	0.051
SW027	SW00325EG	5/27/95	IA_IM/IRA	2.505	0.097	0.138	0.014	5.056	0.178
SW027	SW00338EG	6/28/95	IA_IM/IRA	1.991	0.085	0.093	0.012	3.253	0.127
SW091	SW00320EG	5/17/95	IA_IM/IRA	2.558	0.104	0.088	0.012	1.81	0.079
SW091	SW00322EG	5/26/95	IA_IM/IRA	1.685	0.083	0.063	0.011	1.459	0.075
SW091	SW00343EG	6/27/95	IA_IM/IRA	3.214	0.142	0.107	0.015	2.681	0.122
SW093	SW00302EG	4/26/95	IA_IM/IRA	1.17	0.056	0.05	0.009	0.666	0.038
SW093	SW00310EG	5/16/95	IA_IM/IRA	0.67	0.037	0.028	0.006	0.238	0.019
SW093	SW00323EG	5/26/95	IA_IM/IRA	0.579	0.034	0.021	0.006	0.507	0.031
SW093	SW00335EG	6/28/95	IA_IM/IRA	1.238	0.056	0.028	0.007	0.914	0.045
SW998	SW00538GS	10/15/94	SW_EVENT	0	0.079	0	0.048	0.02	0.039
SW998	SW00309EG	5/3/95	IA_IM/IRA	0.121	0.018	0.002	0.002	0.109	0.018
SW998	SW00315EG	5/16/95	IA_IM/IRA	0.107	0.013	0.001	0.001	0.086	0.012

Table 2-14 Tier I Station Analytical Results (Gross Alpha & Beta)

				GROSS ALPHA		GROSS BETA	
LOCATION	**SAMPLE#**	**DATE**	**PROJECT**	**Result**	**Error**	**Result**	**Error**
				PCI/L	PCI/L	PCI/L	PCI/L
GS10	SW00301EG	4/26/95	IA_IM/IRA	11	2.0	13	2
GS10	SW00316EG	5/16/95	IA_IM/IRA	5.5	2.0	10	2
GS10	SW00324EG	5/26/95	IA_IM/IRA	6.5	2.0	11.5	2
GS10	SW00334EG	6/28/95	IA_IM/IRA	43	9.0	55	6
GS10	SW00349EG	10/22/95	IA_IM/IRA	4.0	2.0	8	2
GS10	SW00539GS	10/17/94	SW_EVENT	3.5	1.2	5.9	1
GS10	SW00542GS	10/17/94	SW_EVENT	3.8	0.92	8.2	1.1
GS21	SW00308EG	5/3/95	IA_IM/IRA	4.0	1.0	5.5	2
GS21	SW00313EG	5/16/95	IA_IM/IRA	6.5	2.0	10	2
GS21	SW00339EG	6/28/95	IA_IM/IRA	7.0	2.0	18	2
GS21	SW00307EG	5/3/95	IA_IM/IRA	4.0	1.0	7.0	2
GS21	SW00314EG	5/16/95	IA_IM/IRA	2.5	1.0	7.5	2
GS21	SW00340EG	6/28/95	IA_IM/IRA	5.0	1.0	15	2
GS23	SW00331EG	6/17/95	IA_IM/IRA	4.0	1.0	5.0	1
GS23	SW00346EG	8/28/95	IA_IM/IRA	0.8	0.9	5.0	1
GS24	SW00306EG	5/2/95	IA_IM/IRA	17	4.0	26	3.5
GS24	SW00341EG	6/28/95	IA_IM/IRA	19	5.0	34	3
GS24	SW00348EG	10/22/95	IA_IM/IRA	2.0	1.0	5.0	1
GS25	SW00305EG	5/2/95	IA_IM/IRA	7.0	2.0	9.0	2
GS25	SW00317EG	5/16/95	IA_IM/IRA	4.0	1.0	5.5	2
GS25	SW00342EG	6/28/95	IA_IM/IRA	10	2.0	15	2
GS25	SW00353EG	10/23/95	IA_IM/IRA	3.0	1.0	3.0	1
SW022	SW00304EG	5/2/95	IA_IM/IRA	5.0	2.0	9.0	2
SW022	SW00311EG	5/16/95	IA_IM/IRA	6.0	2.0	10.5	2
SW022	SW00337EG	6/28/95	IA_IM/IRA	15	5.0	29	3
SW022	SW00350EG	10/23/95	IA_IM/IRA	1.0	1.0	5.0	1
SW027	SW00312EG	5/17/95	IA_IM/IRA	6.5	2.0	9.0	2
SW027	SW00325EG	5/27/95	IA_IM/IRA	13	3.0	10	4
SW027	SW00338EG	6/28/95	IA_IM/IRA	11	2.0	10	1
SW091	SW00320EG	5/17/95	IA_IM/IRA	10	3.0	15.5	3
SW091	SW00322EG	5/26/95	IA_IM/IRA	26	7.0	45	6
SW091	SW00343EG	6/27/95	IA_IM/IRA	96	19	118	14
SW093	SW00302EG	4/26/95	IA_IM/IRA	7.5	2.0	10.5	3
SW093	SW00310EG	5/16/95	IA_IM/IRA	3.0	1.0	8.0	2
SW093	SW00323EG	5/26/95	IA_IM/IRA	6.0	2.0	14	2
SW093	SW00335EG	6/28/95	IA_IM/IRA	10	2.0	15	2
SW998	SW00538GS	10/15/94	SW_EVENT	0.5	0.47	5.4	1.1
SW998	SW00309EG	5/3/95	IA_IM/IRA	2.0	1.0	5.5	1.5
SW998	SW00315EG	5/16/95	IA_IM/IRA	3.0	1.0	6.67	2

Table 2-15 Tier I Stations Analytical Results (Total Metals)

LOCATION	SAMPLE#	DATE	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM
			ug/l	ug/l	ug/l	ug/l	ug/l
GS10	SW00301EG	4/26/95	20,200	7.4	4.4	128	0.87
	SW00324EG	5/26/95	2,770	30	5	77.7	2.5
	SW00330EG	5/31/95	7,080	30	5	110	2.5
	SW00334EG	6/28/95	14,000	30	6	180	2.5
GS21	SW00308EG	5/3/95	5,660	0.2	1.1	17.8	0.1
	SW00327EG	5/31/95	3,900	30	5	48.9	2.5
	SW00339EG	6/28/95	3,700	30	5	100	2.5
GS22	SW00307EG	5/3/95	1,940	0.2	1.1	57.3	0.1
	SW00328EG	5/31/95	1,770	30	5	35.9	2.5
	SW00340EG	6/28/95	2,400	30	5	100	2.5
GS23	SW00331EG	6/17/95	46	30	5	39.5	2.5
	SW00346EG	8/28/95	100	30	5	100	2.5
GS24	SW00306EG	5/2/95	26,800	0.2	1.1	74.8	0.33
	SW00341EG	6/28/95	16,000	30	5	160	2.5
	SW00348EG	10/22/95	598	40	5	94	2.5
GS25	SW00305EG	5/2/95	3,130	0.2	1.1	81	0.1
	SW00342EG	6/28/95	3,800	30	5	100	2.5
SW022	SW00304EG	5/2/95	4,190	8.7	1.1	82.3	0.1
	SW00329EG	5/31/95	9,210	30	5	104	2.5
	SW00337EG	6/28/95	20,000	30	5	170	2.5
SW027	SW00325EG	5/27/95	5,630	30	5	145	2.5
	SW00338EG	6/28/95	4,000	30	5	140	2.5
SW091	SW00322EG	5/26/95	58,900	30	5	450	3
	SW00343EG	6/27/95	77,000	30	23	760	2.5
SW093	SW00302EG	4/26/95	15,340	0.7772	2.9389	125.6489	0.61945
	SW00323EG	5/26/95	5,705	30	5	104.5	2.5
	SW00335EG	6/28/95	5,500	30	5	60	2.5
SW998	SW00309EG	5/3/95	3,320	0.2	1.1	44.9	0.1

Table 2-16 Tier I Station Analytical Results (Total Metals - Cont.)

LOCATION	SAMPLE#	DATE	CADMIUM	CALCIUM	CESIUM	CHROMIUM	COBALT
			ug/l	ug/l	ug/l	ug/l	ug/l
GS10	SW00301EG	4/26/95	0.2	22200	2.7	20.6	4.1
	SW00324EG	5/26/95	2.5	26100	500	6.2	25
	SW00330EG	5/31/95	2.5	37500	500	5	25
	SW00334EG	6/28/95	2.5	55500	500	14.5	5.5
GS21	SW00308EG	5/3/95	0.2	8110	0.62	3.1	0.38
	SW00327EG	5/31/95	2.5	6930	500	8.9	25
	SW00339EG	6/28/95	2.5	5200	500	5	25
GS22	SW00307EG	5/3/95	0.2	27600	0.22	4.9	0.76
	SW00328EG	5/31/95	2.5	10000	500	8.1	25
	SW00340EG	6/28/95	2.5	4100	500	7	25
GS23	SW00331EG	6/17/95	2.5	34300	500	5	25
	SW00346EG	8/28/95	2.5	19000	500	5	25
GS24	SW00306EG	5/2/95	0.2	19700	4	10.6	2.4
	SW00341EG	6/28/95	2.5	17000	3	17	6
	SW00348EG	10/22/95	2.5	13740	500	5	25
GS25	SW00305EG	5/2/95	0.52	34200	0.43	3.3	1
	SW00342EG	6/28/95	2.5	5300	500	5	25
SW022	SW00304EG	5/2/95	0.2	32000	0.58	6	1.3
	SW00329EG	5/31/95	2.5	32800	500	12.9	25
	SW00337EG	6/28/95	2.5	46000	500	20	7
SW027	SW00325EG	5/27/95	2.5	56900	500	5	25
	SW00338EG	6/28/95	2.5	62000	500	5	25
SW091	SW00322EG	5/26/95	2.5	54100	500	57.7	19.2
	SW00343EG	6/27/95	2.5	84000	500	76	29
SW093	SW00302EG	4/26/95	0.2	24000	2.09335	16.31335	2.90445
	SW00323EG	5/26/95	2.5	24900	500	5	25
	SW00335EG	6/28/95	2.5	15000	500	5	25
SW998	SW00309EG	5/3/95	0.2	9500	0.33	7.2	0.71

Table 2-17 Tier I Stations Analytical Results (Total Metals - Cont.)

LOCATION	SAMPLE#	DATE	COPPER	IRON	LEAD	LITHIUM	MAGNESIUM
			ug/l	ug/l	ug/l	ug/l	ug/l
GS10	SW00301EG	4/26/95	17	13000	14	13.4	5190
	SW00324EG	5/26/95	12.1	3030	2.5	5	5290
	SW00330EG	5/31/95	15.8	5250	5.7	8.4	7980
	SW00334EG	6/28/95	17	12000	17	10	12500
GS21	SW00308EG	5/3/95	3.9	3760	2.5	3.5	1640
	SW00327EG	5/31/95	21.7	5250	15.4	4.5	2130
	SW00339EG	6/28/95	24	4800	20	50	1900
GS22	SW00307EG	5/3/95	8.6	1970	7.7	2.9	4080
	SW00328EG	5/31/95	15.3	2790	23.3	3.5	1910
	SW00340EG	6/28/95	18	2800	28	50	1200
GS23	SW00331EG	6/17/95	14.9	1615	2.5	7.25	8070
	SW00346EG	8/28/95	33	1800	2.5	50	3900
GS24	SW00306EG	5/2/95	12.1	18400	8	16.1	6430
	SW00341EG	6/28/95	31	14000	25	50	5500
	SW00348EG	10/22/95	9.8	526	2.5	50	2520
GS25	SW00305EG	5/2/95	13.7	2060	5.7	4.2	7990
	SW00342EG	6/28/95	78	3900	46	50	1500
SW022	SW00304EG	5/2/95	8.6	2780	6.2	4.5	5940
	SW00329EG	5/31/95	16.1	8940	9	8.2	5900
	SW00337EG	6/28/95	24	17000	27	10	6100
SW027	SW00325EG	5/27/95	13	4010	2.5	17.3	12000
	SW00338EG	6/28/95	5	2800	2.5	10	13000
SW091	SW00322EG	5/26/95	63.9	64700	15.55	38.1	17000
	SW00343EG	6/27/95	76	72000	89	40	25000
SW093	SW00302EG	4/26/95	12.0878	10100	8.78665	10.95555	6080
	SW00323EG	5/26/95	11.75	6520	5.4	6.35	5590
	SW00335EG	6/28/95	15	5200	10	50	3400
SW998	SW00309EG	5/3/95	6.1	2260	6.7	2.4	2200

Table 2-18 Tier I Stations Analytical Results (Total Metals - Cont.)

LOCATION	SAMPLE#	DATE	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	POTASSIUM
			ug/l	ug/l	ug/l	ug/l	ug/l
GS10	SW00301EG	4/26/95	170	0.1	1.3	14.6	5440
	SW00324EG	5/26/95	69.3	0.1	100	20	2770
	SW00330EG	5/31/95	75.5	0.1	100	20	2500
	SW00334EG	6/28/95	1200	0.1	100	20	4100
GS21	SW00308EG	5/3/95	20.1	0.1	0.35	1.5	2500
	SW00327EG	5/31/95	110	0.1	100	20	2060
	SW00339EG	6/28/95	110	0.1	100	20	2100
GS22	SW00307EG	5/3/95	48.6	0.1	1.2	3.8	2090
	SW00328EG	5/31/95	57	0.1	100	20	1410
	SW00340EG	6/28/95	70	0.1	100	20	1200
GS23	SW00331EG	6/17/95	35.6	0.0635	10	16.15	3950
	SW00346EG	8/28/95	32.5	0.1	100	20	5000
GS24	SW00306EG	5/2/95	97.7	0.1	0.72	7	7800
	SW00341EG	6/28/95	250	0.1	100	20	5500
	SW00348EG	10/22/95	23.4	0.1	100	20	2420
GS25	SW00305EG	5/2/95	49.7	0.1	1.1	3.9	2480
	SW00342EG	6/28/95	120	0.1	100	20	1200
SW022	SW00304EG	5/2/95	52	0.1	0.9	4.8	3620
	SW00329EG	5/31/95	130	0.1	100	20	3390
	SW00337EG	6/28/95	260	0.1	100	20	4900
SW027	SW00325EG	5/27/95	50.2	0.1	100	20	5650
	SW00338EG	6/28/95	65	0.1	100	20	5000
SW091	SW00322EG	5/26/95	580	0.1	100	55.9	13200
	SW00343EG	6/27/95	1200	0.15	100	60	16000
SW093	SW00302EG	4/26/95	160	0.1	1.02445	11.32555	4940
	SW00323EG	5/26/95	140	0.1	100	13.45	3540
	SW00335EG	6/28/95	110	0.1	100	20	2800
SW998	SW00309EG	5/3/95	33.2	0.1	0.35	3.7	2470

Table 2-19 Tier I Stations Analytical Results (Total Metals - Cont.)

LOCATION	SAMPLE#	DATE	SELENIUM	SILICON	SILVER	SODIUM	STRONTIUM
			ug/l	ug/l	ug/l	ug/l	ug/l
GS10	SW00301EG	4/26/95	3.35	41000	0.26	30000	117
	SW00324EG	5/26/95	2.5	7200	5	16000	153
	SW00330EG	5/31/95	2.5	18000	5	22000	246
	SW00334EG	6/28/95	2.5	26000	5	26000	320
GS21	SW00308EG	5/3/95	3.35	12000	0.1	9100	17.5
	SW00327EG	5/31/95	2.5	8600	5	5600	100
	SW00339EG	6/28/95	2.5	7700	5	3200	30
GS22	SW00307EG	5/3/95	3.35	6200	0.1	13000	134
	SW00328EG	5/31/95	2.5	4000	5	5100	46.8
	SW00340EG	6/28/95	2.5	4600	5	2000	20
GS23	SW00331EG	6/17/95	2.5	7700	5	25000	223
	SW00346EG	8/28/95	2.5	6650	5	16500	100
GS24	SW00306EG	5/2/95	3.35	54000	0.1	12000	49.6
	SW00341EG	6/28/95	2.5	28000	5	5600	100
	SW00348EG	10/22/95	2.5	1780	5	9320	74
GS25	SW00305EG	5/2/95	3.35	8100	0.1	28000	224
	SW00342EG	6/28/95	2.5	7400	5	2300	30
SW022	SW00304EG	5/2/95	3.35	9400	0.1	24000	192
	SW00329EG	5/31/95	2.5	18000	5	14000	148
	SW00337EG	6/28/95	2.5	32000	5	6100	120
SW027	SW00325EG	5/27/95	2.5	16000	5	25000	342
	SW00338EG	6/28/95	2.5	12000	5	27000	360
SW091	SW00322EG	5/26/95	2.5	97000	5	14000	307
	SW00343EG	6/27/95	2.5	85000	5	26000	450
SW093	SW00302EG	4/26/95	3.35	22000	0.1	60000	154.63445
	SW00323EG	5/26/95	2.5	14000	5	22000	154.5
	SW00335EG	6/28/95	2.5	12000	5	7800	80
SW998	SW00309EG	5/3/95	3.35	7900	0.1	15000	62

Table 2-20 Tier 1 Stations Analytical Results (Metals Cont.)

LOCATION	SAMPLE#	DATE	THALLIUM	TIN	VANADIUM	ZINC
			ug/l	ug/l	ug/l	ug/l
GS10	SW00301EG	4/26/95	0.26	5	43.8	130
	SW00324EG	5/26/95	14.8	100	11.2	152
	SW00330EG	5/31/95	12.7	100	18.5	140
	SW00334EG	6/28/95	5	100	37	210
GS21	SW00308EG	5/3/95	0.1	5	4.4	123
	SW00327EG	5/31/95	11	100	11.3	446
	SW00339EG	6/28/95	5	100	8	560
GS22	SW00307EG	5/3/95	0.1	5	19.8	177
	SW00328EG	5/31/95	11	100	7	346
	SW00340EG	6/28/95	5	100	5	240
GS23	SW00331EG	6/17/95	5	100	25	58.35
	SW00346EG	8/28/95	5	100	25	130
GS24	SW00306EG	5/2/95	0.1	5	23.6	133
	SW00341EG	6/28/95	5	100	36	270
	SW00348EG	10/22/95	5	100	21.4	92
GS25	SW00305EG	5/2/95	0.1	5	8.4	158
	SW00342EG	6/28/95	5	100	8	440
SW022	SW00304EG	5/2/95	0.1	5	11.1	68.9
	SW00329EG	5/31/95	5	100	22.4	135
	SW00337EG	6/28/95	5	100	44	160
SW027	SW00325EG	5/27/95	20	100	13.2	45.2
	SW00338EG	6/28/95	5	100	10	50
SW091	SW00322EG	5/26/95	11.05	100	144	396
	SW00343EG	6/27/95	5	100	180	1400
SW093	SW00302EG	4/26/95	0.1	5	33.1389	88.91555
	SW00323EG	5/26/95	12.5	100	15.15	110.5
	SW00335EG	6/28/95	5	100	12	120
SW998	SW00309EG	5/3/95	0.1	5	6.9	54.1

Table 2-21 Tier I Stations Analytical Results (Water Quality)

LOCATION	SAMPLE#	DATE	BICARBONATE AS CACO3 MG/L	CARBONATE AS CACO3 MG/L	CHLORIDE MG/L	FECAL COLIFORM Colonies
GS10	SW00301EG	4/26/95	44	5	43.3	.
GS10	SW00316EG	5/16/95	.	.	20.7	.
GS10	SW00324EG	5/26/95	72	5	17.1	.
GS10	SW00330EG	5/31/95	104	5	25.0	.
GS10	SW00334EG	6/28/95	180	5	32.0	.
GS10	SW00349EG	10/22/95	.	.	32.7	.
GS21	SW00308EG	5/3/95	.	.	7.0	.
GS21	SW00313EG	5/16/95	.	.	23.3	.
GS21	SW00327EG	5/31/95	15	5	3.6	.
GS21	SW00339EG	6/28/95	5	5	3.0	.
GS22	SW00307EG	5/3/95	.	.	23.0	.
GS22	SW00314EG	5/16/95	.	.	8.7	.
GS22	SW00328EG	5/31/95	18	5	9.5	.
GS22	SW00340EG	6/28/95	5	5	2.5	.
GS23	SW00331EG	6/17/95	84	5	21.0	8900
GS23	SW00346EG	8/28/95	.	.	17.3	Too Numerous To Count
GS24	SW00306EG	5/2/95	.	.	6.7	.
GS24	SW00341EG	6/28/95	44	5	4.0	.
GS24	SW00348EG	10/22/95	.	.	2.5	.
GS25	SW00305EG	5/2/95	.	.	22.5	.
GS25	SW00317EG	5/16/95	.	.	9.0	.
GS25	SW00342EG	6/28/95	7	5	2.5	.
GS25	SW00353EG	10/23/95	.	.	9.1	.
SW022	SW00304EG	5/2/95	.	.	24.6	.
SW022	SW00311EG	5/16/95	.	.	10.2	.
SW022	SW00329EG	5/31/95	89	5	12.4	.
SW022	SW00337EG	6/28/95	110	5	6.0	.
SW022	SW00350EG	10/23/95	.	.	7.0	.
SW027	SW00312EG	5/17/95	.	.	24.3	.
SW027	SW00325EG	5/27/95	149	5	39.9	.
SW027	SW00338EG	6/28/95	190	5	50.0	.
SW091	SW00320EG	5/17/95	.	.	15.9	.
SW091	SW00322EG	5/26/95	124	5	6.0	.
SW091	SW00343EG	6/27/95	180	5	15.0	.
SW093	SW00302EG	4/26/95	48	5	96.1	.
SW093	SW00310EG	5/16/95	.	.	4.5	.
SW093	SW00323EG	5/26/95	64	5	24.3	.
SW093	SW00335EG	6/28/95	46	5	10.0	.
SW998	SW00309EG	5/3/95	.	.	18.6	.
SW998	SW00315EG	5/16/95	.	.	11.9	.

Table 2-22 Tier I Stations Analytical Results (Water Quality)

LOCATION	SAMPLE#	DATE	FLUORIDE MG/L	NITRATE MG/L	NITRATE/NITRITE MG/L AS N	NITRITE MG/L	pH STD. UNITS	PHOSPHORUS MG/L
GS10	SW00301EG	4/26/95	.	2.96	0.7	0.25	7.24	0.49
GS10	SW00316EG	5/16/95	.	.	1.1	.	7.67	0.06
GS10	SW00324EG	5/26/95	0.37	.	1.5	.	7.70	0.12
GS10	SW00330EG	5/31/95	0.47	.	1.4	.	7.90	0.09
GS10	SW00334EG	6/28/95	0.25	.	1.1	.	7.30	0.25
GS10	SW00349EG	10/22/95	.	.	1.1	.	.	0.07
GS21	SW00308EG	5/3/95	.	.	0.8	.	.	0.06
GS21	SW00313EG	5/16/95	.	.	0.8	.	7.68	0.14
GS21	SW00327EG	5/31/95	0.25	.	0.5	.	6.90	0.12
GS21	SW00339EG	6/28/95	0.25	.	1.3	.	7.50	0.08
GS22	SW00307EG	5/3/95	.	.	1.5	.	.	0.07
GS22	SW00314EG	5/16/95	.	.	1.2	.	7.56	0.04
GS22	SW00328EG	5/31/95	0.25	.	0.9	.	7.20	0.08
GS22	SW00340EG	6/28/95	0.25	.	0.9	.	7.30	0.25
GS23	SW00331EG	6/17/95	0.45	.	0.5	.	.	0.24
GS23	SW00346EG	8/28/95	.	.	0.4	.	.	1.16
GS24	SW00306EG	5/2/95	.	.	1.3	.	.	0.43
GS24	SW00341EG	6/28/95	0.25	.	1.2	.	7.60	0.02
GS24	SW00348EG	10/22/95	.	.	0.6	.	.	0.11
GS25	SW00305EG	5/2/95	.	.	1.1	.	.	0.06
GS25	SW00317EG	5/16/95	.	.	1.0	.	7.59	0.06
GS25	SW00342EG	6/28/95	0.25	.	1.1	.	7.30	0.25
GS25	SW00353EG	10/23/95	.	.	0.9	.	.	0.04
SW022	SW00304EG	5/2/95	.	.	1.2	.	.	0.12
SW022	SW00311EG	5/16/95	.	.	0.7	.	7.81	0.17
SW022	SW00329EG	5/31/95	0.33	.	0.6	.	7.80	0.17
SW022	SW00337EG	6/28/95	0.25	.	1.0	.	7.90	0.04
SW022	SW00350EG	10/23/95	.	.	0.7	.	.	0.13
SW027	SW00312EG	5/17/95	.	.	0.9	.	7.66	0.11
SW027	SW00325EG	5/27/95	0.44	.	0.8	.	8.00	0.13
SW027	SW00338EG	6/28/95	0.25	.	0.7	.	7.80	0.16
SW091	SW00320EG	5/17/95	.	.	1.7	.	7.04	0.14
SW091	SW00322EG	5/26/95	0.30	.	1.1	.	7.75	0.65
SW091	SW00343EG	6/27/95	0.25	.	0.9	.	7.60	0.25
SW093	SW00302EG	4/26/95	.	4.05	0.9	0.25	7.60	0.21
SW093	SW00310EG	5/16/95	.	.	0.6	.	6.14	0.12
SW093	SW00323EG	5/26/95	0.31	.	1.0	.	7.60	0.15
SW093	SW00335EG	6/28/95	0.25	.	1.0	.	7.60	0.02
SW998	SW00309EG	5/3/95	.	.	1.3	.	.	0.03
SW998	SW00315EG	5/16/95	.	.	0.7	.	7.57	0.03

Table 2-23 Tier I Stations Analytical Results (Water Quality)

LOCATION	SAMPLE#	DATE	SPECIFIC CONDUCTIVITY MICROSIEMENS / SQ. CM	SULFATE MG/L	TOTAL DISSOLVED SOLIDS MG/L	TOTAL SUSPENDED SOLIDS MG/L
GS10	SW00301EG	4/26/95	322	6.5		
GS10	SW00316EG	5/16/95	227	12.3	171	54
GS10	SW00324EG	5/26/95	243	11.2	167	98
GS10	SW00330EG	5/31/95	342	16.8	238	124
GS10	SW00334EG	6/28/95	410	23.0	250	500
GS10	SW00349EG	10/22/95		14.3	192	14
GS21	SW00308EG	5/3/95		4.7	71	50
GS21	SW00313EG	5/16/95	188	9.5	132	147
GS21	SW00327EG	5/31/95	67	5.1	61	144
GS21	SW00339EG	6/28/95	55	2.5	30	150
GS22	SW00307EG	5/3/95		14.8	111	46
GS22	SW00314EG	5/16/95	95	6.5	63	34
GS22	SW00328EG	5/31/95	105	6.0	57	87
GS22	SW00340EG	6/28/95	42	2.5	20	115
GS23	SW00331EG	6/17/95	382	53.2	233	45
GS23	SW00346EG	8/28/95		28.9	170	33
GS24	SW00306EG	5/2/95		10.2	126	430
GS24	SW00341EG	6/28/95	98	24.0	96	880
GS24	SW00348EG	10/22/95		5.4	73	4
GS25	SW00305EG	5/2/95		25.6	196	65
GS25	SW00317EG	5/16/95	153	14.4	106	25
GS25	SW00342EG	6/28/95	50	10.0	32	160
GS25	SW00353EG	10/23/95		6.8	78	9
SW022	SW00304EG	5/2/95		16.1	190	65
SW022	SW00311EG	5/16/95	177	10.7	127	177
SW022	SW00329EG	5/31/95	236	10.7	146	246
SW022	SW00337EG	6/28/95	130	16.0	66	600
SW022	SW00350EG	10/23/95		6.7	92	3
SW027	SW00312EG	5/17/95	276	17.2	196	77
SW027	SW00325EG	5/27/95	488	34.7	363	98
SW027	SW00338EG	6/28/95	510	34.5	200	74
SW091	SW00320EG	5/17/95	421	22.6	283	163
SW091	SW00322EG	5/26/95	263	10.1	277	1280
SW091	SW00343EG	6/27/95	340	28.0	230	3000
SW093	SW00302EG	4/26/95	568	10.5	303	128
SW093	SW00310EG	5/16/95	49	3.2	52	56
SW093	SW00323EG	5/26/95	249	12.1	195	205
SW093	SW00335EG	6/28/95	130	19.0	76	150
SW998	SW00309EG	5/3/95		7.7	102	30
SW998	SW00315EG	5/16/95	85	4.3	73	47

Table 2-24 Tier I Stations Analytical Results (VOCs)

Industrial Area IM/IRA Surface Water Sampling				VOCs Detected by Method 524.2	
Station	ample Numbe	Date	Analyte	Result ug/L	Qualifier
GS10	SW00316EG	950516	cis-1,2-dichloroethene	2	
GS21	SW00339EG	950628	2-chlorotoluene	0.005	J
GS22	SW00314EG	950516	cis-1,2-dichloroethene	2	
			trichloroethene	2	
			tetrachloroethene	3	
GS22	SW00340EG	950628	No Hits		
GS23	SW00331EG	950617	chloroform	11	
GS23	SW00346EG	950829	chloroform	5	
GS24	SW00341EG	950628	No Hits		
GS25	SW00317EG	950516	No Hits		
SW022	SW00329EG	950531	tetrachloroethene	1	
SW022	SW00337EG	950628	No Hits		
SW027	SW00312EG	950517	No Hits		
SW027	SW00338EG	950628	No Hits		
SW091	SW00320EG	950517	No Hits		
SW091	SW00322EG	950526	No Hits		
SW093	SW00310EG	950516	No Hits		
SW093	SW00323EG	950526	No Hits		
SW998	SW00315EG	950516	No Hits		

Note: No Hits = No detected constituents by Method 524.5.

2.4 Tier II Monitoring Station Data Summary

2.4.1 Tier II: D&D Sub-basin Outfalls

The objective of the Tier II Industrial Area gaging stations is to monitor surface water at the outlet of the sub-basins where D&D and other transition activities are located. This tier provides a more detailed monitoring approach to identify potential releases and to evaluate the effectiveness of the engineering controls being employed at the specific D&D/transition location.

Gaging Station GS27

Location:

- State Plane: 2083680; 749282
- small drainage ditch NW of Building 884 (see Figure 2-3)

Drainage Characteristics:

- Pathway 1
- Buildings: 889, T889A, 884
- Sub-basins: CSWAA5 (Figure 2-2)
- Description: GS27 monitors a small ditch which outfalls to the Central Avenue Ditch northwest of Building 884. Surface water at this site originates as runoff from the areas north and west of 889 and surrounding 884.

Hardware Configuration:

- Primary Device: 2" cutthroat flume (Delta Blue)
- Flow Meter: ISCO® Model 4230 (bubbler)
- Sampler: ISCO® Model 3710 Portable

  ISCO® Model 6000 VOC
- Radio Telemetry: Yes
- Power: DC solar power system
- Water Quality Parameters: Hydrolab® Recorder™ Multiprobe: pH, temperature, conductivity

Discharge Data

Table 2-25. GS27 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

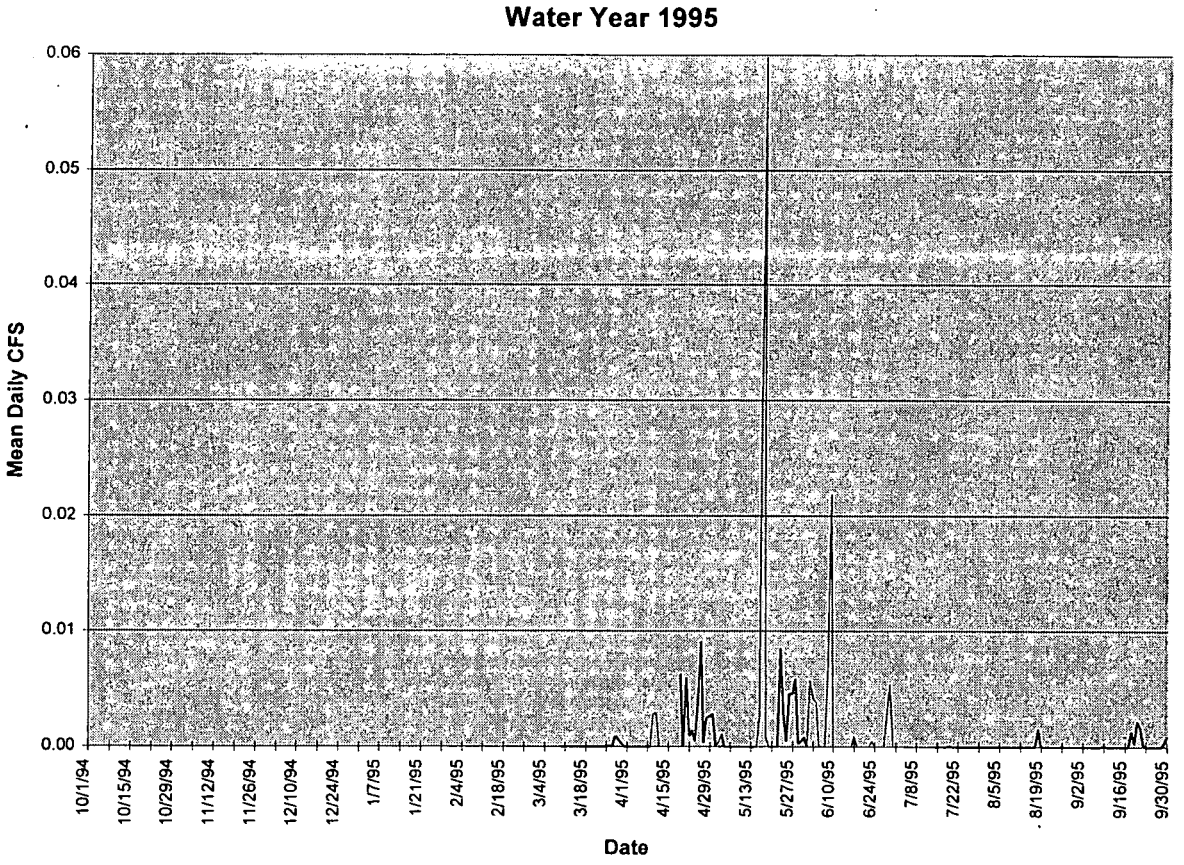
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

GS27					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	No Data	No Data	No Data	0
	11	No Data	No Data	No Data	0
	12	No Data	No Data	No Data	0
1994 Total		No Data	No Data	No Data	0
1995	1	No Data	No Data	No Data	0
	2	No Data	No Data	No Data	0
	3	0	0.0009	0.0001	23
	4	0	0.0091	0.0016	27
	5	0	0.0598	0.0030	31
	6	0	0.0218	0.0017	30
	7	0	9.71218E-05	3.13296E-06	31
	8	0	0.002	0.0001	31
	9	0	0.002	0.0002	30
1995 Total		0	0.060	0.001	203
Grand Total		0	0.060	0.001	203

Figure 2-15. GS27 Mean Daily Discharge



Gaging Station GS28

Location:

- State Plane: 2084010; 749282
- concrete drainage channel northwest of Building 865 (see Figure 2-3)

Drainage Characteristics:

- Pathway 1
- Buildings: 889, T889A, 879, 883, 866, 827, 867, 865
- Sub-basins: CSWAA5 (Figure 2-2)
- Description: GS28 monitors a concrete drainage channel which outfalls to the Central Avenue Ditch northeast of Building 889. Surface water at this site originates as runoff from the northern portion of the 800 Area.

Hardware Configuration:

- Primary Device: 4" cutthroat flume (Alpha Lou)
- Flow Meter: ISCO® Model 4230 (bubbler)
- Sampler: ISCO® Model 3710 Portable

  ISCO® Model 6000 VOC
- Radio Telemetry: Yes
- Power: DC solar power system
- Water Quality Parameters: Hydrolab® Recorder™ Multiprobe: pH, temperature, conductivity

Discharge Data

Table 2-26. GS28 Mean Daily Discharge Data

KEY: Average of Mean CFS = Average mean daily discharge for the month.

Min of Mean CFS = The minimum mean daily discharge for the month.

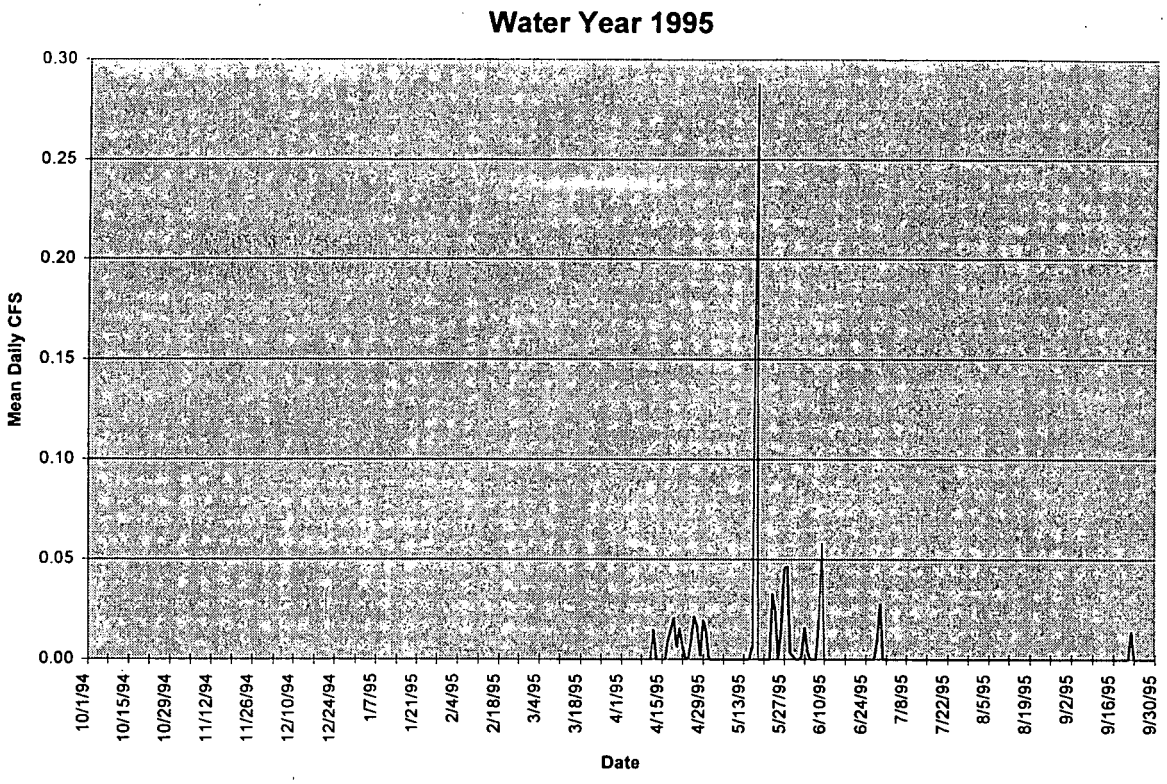
Max of Mean CFS = The Maximum mean daily discharge for the month.

Days of Record = Number of days of record obtained in the month.

Some data are estimated from field observations and discharge record at adjacent gages. Estimated data are sometimes required due to a malfunctioning, damaged, or overtopped flow control device.

GS28					
Year	Month	Min of Mean CFS	Max of Mean CFS	Average of Mean CFS	Days of Record
1994	10	No Data	No Data	No Data	0
	11	No Data	No Data	No Data	0
	12	No Data	No Data	No Data	0
1994 Total		No Data	No Data	No Data	0
1995	1	No Data	No Data	No Data	0
	2	No Data	No Data	No Data	0
	3	0	0	0	23
	4	0	0.022	0.006	29
	5	0	0.288	0.015	31
	6	0	0.058	0.005	30
	7	0	0.000	0.000	31
	8	0	0.000	0.000	31
	9	0	0.014	0.0005	30
1995 Total		0	0.288	0.004	205
Grand Total		0	0.288	0.004	205

Figure 2-16. GS28 Mean Daily Discharge



2.4.2 Tier II Water-Quality

The Tier II water-quality data are for stormwater runoff samples collected at gaging stations GS27 and GS28. Isotopic radiochemistry data were obtained by alpha spectrometry. Gross alpha and Gross Beta activity data were obtained by scintillation counting. Total metals data were obtained by inductively coupled plasma mass spectrometry. Water quality parameter data were obtained by SW846 methods. Volatile organic analyte data were obtained by EPA Method 524.2.

Table 2-27 Tier II Stations Analytical Results (Am-241 & Pu-238,340)

			AMERICIUM-241		PLUTONIUM-239,240	
Location	Sample #	Date	Result	Error	Result	Error
			PCI/L	PCI/L	PCI/L	PCI/L
GS27	SW00321EG	5/23/95	0.312	0.032	0.884	0.041
GS27	SW00344EG	6/28/95	27.33	2.726	90	3.06
GS27	SW00347EG	9/18/95	26.72	2.809	56.56	2.355
GS28	SW00319EG	5/16/95	0.082	0.001	0.171	0.014
GS28	SW00345EG	6/28/95	0.217	0.028	0.356	0.023

Table 2-28 Tier II Stations Analytical Results (U-233/234,U-235, & U-238)

			URANIUM-233,234		URANIUM-235		URANIUM-238	
Location	Sample	Date	Result	Error	Result	Error	Result	Error
			PCI/L	PCI/L	PCI/L	PCI/L	PCI/L	PCI/L
GS27	SW00321EG	5/23/95	0.613	0.034	0.016	0.005	0.367	0.025
GS27	SW00344EG	6/28/95	2.299	0.114	0.076	0.014	2.156	0.109
GS27	SW00347EG	9/18/95	1.074	0.054	0.032	0.007	1.068	0.054
GS28	SW00319EG	5/16/95	0.583	0.034	0.02	0.005	0.323	0.024
GS28	SW00345EG	6/28/95	0.297	0.022	0.013	0.004	0.295	0.022

Table 2-29 Tier II Stations Analytical Results (Gross Alpha & Gross Beta)

			GROSS ALPHA		GROSS BETA	
Location	**Sample #**	**Date**	**Result**	**Error**	**Result**	**Error**
			PCI/L	PCI/L	PCI/L	PCI/L
GS27	SW00321EG	5/23/95	3.0	1.0	4.0	2
GS27	SW00344EG	6/28/95	222	22	80	8
GS27	SW00347EG	9/18/95	141	16	52	5
GS28	SW00319EG	5/16/95	2.5	1.0	7.0	2
GS28	SW00345EG	6/28/95	8.0	2.0	15	2

Note : Measurements are in pCi/L

Table 2-30 Tier II Stations Analytical Results (Total Metals)

LOCATION	SAMPLE#	DATE	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM
			ug/l	ug/l	ug/l	ug/l	ug/l
GS27	SW00326EG	5/31/95	33100	30	10.9	279	2.6
GS27	SW00344EG	6/28/95	46000.0	30	17	370	3
GS27	SW00347EG	9/18/95	26000.0	30	8	230	3
GS28	SW00345EG	6/28/95	3800.00	30	5	100	3

LOCATION	SAMPLE#	DATE	CADMIUM	CALCIUM	CESIUM	CHROMIUM	COBALT
			ug/l	ug/l	ug/l	ug/l	ug/l
GS27	SW00326EG	5/31/95	2.5	77900	500	39.2	16.9
GS27	SW00344EG	6/28/95	3	88000	9	56	23
GS27	SW00347EG	9/18/95	3	55500	500	34	16
GS28	SW00345EG	6/28/95	3	11000	500	5	25

LOCATION	SAMPLE#	DATE	COPPER	IRON	LEAD	LITHIUM	MAGNESIUM
			ug/l	ug/l	ug/l	ug/l	ug/l
GS27	SW00326EG	5/31/95	67.1	45800	47.3	25.3	12700
GS27	SW00344EG	6/28/95	88	59500	100	10	16000
GS27	SW00347EG	9/18/95	53	16300	56	20	10000
GS28	SW00345EG	6/28/95	16	4170	11	50	1500

LOCATION	SAMPLE#	DATE	PROJECT	UNITS	MANGANESE	MERCURY	MOLYBDENUM	NICKEL	POTASSIUM
					ug/l	ug/l	ug/l	ug/l	ug/l
GS27	SW00326EG	5/31/95	IA_IM/IRA	UG/L	787	0.1	100	33.9	7520
GS27	SW00344EG	6/28/95	IA_IM/IRA	UG/L	1100	0.1	100	40	11000
GS27	SW00347EG	9/18/95	SW_EVENT	UG/L	341	0.1	100	30	7700
GS28	SW00345EG	6/28/95	IA_IM/IRA	UG/L	74	0.1	100	20	3200

LOCATION	SAMPLE#	DATE	PROJECT	UNITS	SELENIUM	SILICON	SILVER	SODIUM	STRONTIUM
					ug/l	ug/l	ug/l	ug/l	ug/l
GS27	SW00326EG	5/31/95	IA_IM/IRA	UG/L	2.5	53200	5	3530	201
GS27	SW00344EG	6/28/95	IA_IM/IRA	UG/L	3	63000	5	1900	210
GS27	SW00347EG	9/18/95	SW_EVENT	UG/L	3	45500	5	2000	135
GS28	SW00345EG	6/28/95	IA_IM/IRA	UG/L	3	7900	5	1400	40

LOCATION	SAMPLE#	DATE	PROJECT	UNITS	THALLIUM	TIN	VANADIUM	ZINC
					ug/l	ug/l	ug/l	ug/l
GS27	SW00326EG	5/31/95	IA_IM/IRA	UG/L	5	100	93.9	476
GS27	SW00344EG	6/28/95	IA_IM/IRA	UG/L	5	100	130	590
GS27	SW00347EG	9/18/95	SW_EVENT	UG/L	5	100	74	480
GS28	SW00345EG	6/28/95	IA_IM/IRA	UG/L	5	100	10	200

Table 2-31 Tier II Stations Analytical Results (Water Quality)

LOCATION	SAMPLE#	DATE	BICARBONATE AS CACO3 MG/L	CARBONATE AS CACO3 MG/L	CHLORIDE MG/L	FLUORIDE MG/L	NITRATE/NITRITE MG/L AS N
GS27	SW00321EG	5/23/95	.	.	3.8	.	3.5
GS27	SW00326EG	5/31/95	148	5	3.7	0.18	3.0
GS27	SW00344EG	6/28/95	19	5	2.5	0.25	1.3
GS27	SW00347EG	9/18/95	.	.	.	.	1.1
GS28	SW00319EG	5/16/95	.	.	1.1	.	0.8
GS28	SW00345EG	6/28/95	17	5	2.5	0.25	2.8

LOCATION	SAMPLE#	DATE	pH STD. UNITS	PHOSPHORUS MG/L	SPECIFIC CONDUCTIVITY MICROSIEMENS / SQ. CM	SULFATE MG/L	TOTAL DISSOLVED SOLIDS MG/L	TOTAL SUSPENDED SOLIDS MG/L
GS27	SW00321EG	5/23/95	6.87	0.13	134	10.8	108	15
GS27	SW00326EG	5/31/95	8.15	0.74	130	8.1	224	1280
GS27	SW00344EG	6/28/95	8.40	0.25	80	24.0	91	1650
GS27	SW00347EG	9/18/95	.	0.75	.	.	.	.
GS28	SW00319EG	5/16/95	7.61	0.08	56	3.0	45	30
GS28	SW00345EG	6/28/95	8.00	0.14	78	2.5	58	120

Table 2-32 Tier II Stations Analytical Results (VOCs)

Station	Sample #	Date	Time	Analyte
GS27	SW00321EG	5/23/95	0038	No Hits
GS27	SW00326EG	5/31/95	1634	No Hits
GS27	SW00344EG	6/28/95	1546	No Hits
GS28	SW00319EG	5/16/95	2138	No Hits
GS28	SW00345EG	6/28/95	1609	No Hits

Note: No Hits detected constituents by Method 524.5

2.4.3 Planned activities for the next year

In Water Year 1996, the IA IM/IRA will continue to monitor at all Tier I monitoring stations except for station GS23. Station GS23 will be phased out of service because the source of the GS23 flows has been determined to be Building 887 Septic Lift overflow. Corrective actions to prevent future Building 887 overflows have been initiated with completion expected in the summer of 1996.

D&D schedules for Building 889 have been modified over the past several months, but monitoring at Tier II stations GS27 and GS28 has remained in place in anticipation of D&D commencement during FY96. D&D of the No. 6 Fuel Oil tanks located on Central Avenue and 7th Street has been planned for FY96. In response, the IA IM/IRA program installed flow measurement equipment at two new IA IM/IRA monitoring stations: GS29 (Cottonwood Ditch at 7th Street) and GS30 (Central Avenue Ditch at 7th Street). Data collection at these stations is scheduled to commence in March 1996.

2.4.4 Scheduled update for future transition activities

The IA IM/IRA staff is working with D&D personnel to determine the future monitoring needs for Site transition. The Accelerated Site Action Plan (ASAP) will guide the future transition activities, and the IA IM/IRA is anticipated to be the monitoring mechanism for determining ASAP impacts.

Until ASAP activities begin, the IA IM/IRA will focus on the following transition activities.

- Building 889 D&D
- Building 887 Septic Lift Overflow Warning System for Building 881
- No. 6 Fuel Oil Tanks D&D at Central Avenue and 7th Street
- Special Nuclear Material Stabilization and Consolidation in the Protected Area

The IA IM/IRA surface-water monitoring program has provided source identification and control capability for the Site. Continued operation of the program will provide a means for detecting and ameliorating potential chronic releases of contaminants of concern to Site watersheds.

3. GROUNDWATER MONITORING PROGRAM

3.1 Groundwater At RFETS

The physical setting is important to understanding the nature of groundwater flow and contaminant transport at Rocky Flats Technology Site(RFETS). Detailed studies of the hydrogeology are presented in the "Hydrogeologic Characterization Report for the Rocky Flats" (EG&G, 1995a). Detailed studies of the geology are presented in the companion document, "Geologic Characterization Report of the Rocky Flats Environmental Technology Site." (EG&G, 1995b). Plume configurations used in the Strategy were derived from the 1995 Well Evaluation Project.

Shallow groundwater flow can be described as occurring through two distinct layers, each exhibiting common hydrologic characteristics allowing for grouping into two hydrostratigraphic units. These units are generally referred to as the (1) upper hydrostratigraphic unit (UHSU) and (2) lower hydrostratigraphic unit (LHSU).

The UHSU is the predominant water-bearing unit of concern at RFETS. It consists of sandy and gravely soils mixed with clay (i.e., alluvium, colluvium, and artificial fill) as well as weathered bedrock and minor bedrock sandstones hydraulically connected to the alluvium. The LHSU consists of unweathered claystone, with some interbedded siltstones and sandstones. There is a significant difference in each units' ability to allow groundwater flow. For example, the typical hydraulic conductivity values for the Rocky Flats Alluvium are about 2 x 10-4 centimeters per second (cm/sec), while the unweathered Laramie claystones exhibit hydraulic conductivity values of 3 x 10-7 cm/sec, similar to that required for a landfill liner (EG&G, 1995a). However, neither the UHSU nor the LHSU has sufficient transmissivity or saturated thickness to be developed as a water source for residential use, although some isolated (i.e., UHSU) bedrock sandstones in OU 2 and valley-fill alluvial materials in Walnut Creek near Indiana Street could provide sufficient water to support limited household-use.

The spread of contamination in groundwater at RFETS is confined within the site buffer zone boundaries and is limited by hydrogeologic conditions. Generally, groundwater flows slowly at RFETS. The speed of groundwater moving through the Rocky Flats Alluvium in the East Trenches Area is estimated to be about 50 feet per year. Because natural processes inhibit or retard the transport of contaminants in groundwater, the speeds at which chlorinated solvents are transported at this location are estimated to range between 2.5 and 25 feet per year.

The LHSU provides natural vertical containment for the impacted UHSU groundwater. Directly underlying the IA, low permeability claystones of the LHSU form a barrier no less than 500 feet in thickness, effectively preventing contamination from migrating downward to the Laramie/Fox Hills aquifer. By comparison, the average Resource Conservation and Recovery Act (RCRA) landfill is lined with two to four feet of similar material. As a result of these stratigraphic relationships, all contaminated groundwater emerges as surface water before leaving the site. In addition, there is no known hydraulic connection between domestic wells located offsite and impacted groundwater at Rocky Flats. Horizontal spread of the plumes is mitigated by the low hydraulic conductivity, lack of continuous permeable beds, limited zones of saturation, and high contaminant retardation factors characteristic of the clay-rich units comprising the UHSU. High contaminant retardation in clayey soils is caused by the small pores inhibiting the passage of the contaminants as well as the process of adsorption onto the aquifer materials.

Groundwater in the UHSU preferentially flows along pre-existing channels cut into the bedrock. These channels are known to occur in the IA, Solar Ponds, 881 Hillside, 903 Pad, and East Trenches Areas. Other hydrogeologic controls for groundwater flow and contaminant transport are hydraulic gradient, distribution of subcropping sandstones and claystones, and topography. In addition, groundwater in the IA may preferentially flow along buried sewer lines and process-waste lines. Groundwater in the surficial deposits of the UHSU generally flows to the east, following bedrock and surface topography and discharges to surface drainages where surficial deposits are intersected by drainages. These drainages are the main groundwater pathways offsite. The surface-water flow onsite is controlled by artificial impoundments in these drainages.

The available hydrogeologic and isotopic data suggest that faults are not significant conduits for downward vertical groundwater flow to deep aquifers. Evidence of limited hydraulic communication between UHSU and LHSU groundwater was found to exist in some wells, but these occurrences do not present a consistent pattern with known fault locations. Isolated fractures in unfaulted bedrock, as opposed to fault zone fractures, are the most likely mode of transport for UHSU groundwater to reach unweathered bedrock. Due to the thickness and lithology of the LHSU, it is likely that fault zones become more impermeable with depth, thus reducing the potential for any shallow groundwater flow to the Laramie/Fox Hills aquifer.

3.2 Groundwater Monitoring

Groundwater monitoring is a component of the Industrial Area IM/IRA program. Monitoring is conducted as part of the RFETS groundwater monitoring program, and sampling methodology and analysis methods for the IM/IRA follow standard protocols used for all groundwater samples on Site. Groundwater monitoring for the IM/IRA was initiated in the fourth quarter, 1993 to provide data for the assessment of water quality in the Industrial Area. These data were used to help guide the IM/IRA evaluation and set requirements for a long term monitoring program for groundwater during the D&D process. Data were collected from pre-existing wells, most of which were installed in 1989 but were rarely sampled.

To date there has been eight consecutive quarters of data collected from the twenty-five wells identified for long term monitoring in the IM/IRA decision document. This sampling will be used to establish a baseline of groundwater quality prior to the start of D&D activities. Water level information has been collected quarterly since 1989, and will be used to estimate groundwater levels that might impact D&D operations or influence contaminant transport. Table 1 lists the chemical parameters that have been collected in IM/IRA wells during the first eight quarters of monitoring. Upon completion of baseline water quality development, the chemical parameter list will be evaluated to fine tune the analyte suite.

Table 3-1 Chemical Constituents Historically Monitored in IM/IRA Groundwater Wells

Field Parameters pH Specific Conductance Temperature Alkalinity
Indicators Total Dissolved solids (TDS) Total Suspended Solids (TSS)
Metals Target Analyte List Aluminum (Al) Antimony (Sb) Arsenic (As) Barium (Ba) Beryllium (Be) Cadmium (Cd) Calcium (Ca) Chromium (Cr) Cobalt (Co) Copper (Cu) Iron (Fe) Lead (Pb)

Magnesium (Mg) Manganese (Mn) Mercury (Hg) Nickel (Ni) Potassium (K) Selenium (Se) Silver (Ag) Silicon (Si) Sodium (Na) Thallium (Tl) Vanadium (V) Zinc (Zn) Cesium (Cs) Lithium (Li) Molybdenum (Mo) Strontium (Sr) Tin (Sn)
Anions Ammonia Carbonate (CO_3 as $CaCO_3$) Bicarbonate (HCO_3 as $CaCO_3$) Chloride (Cl) Fluoride (F) Sulfate (SO_4) Nitrate/Nitrite (NO_3/NO_2) Cyanide (as CN) Orthophosphate
Volatile Organic Compounds[e] Target Compound List - Volatile Chloromethane (CH_3Cl) Bromomethane (CH_3Br) Vinyl Chloride (C_2H_3Cl) Chloroethane (C_2H_5Cl) Methylene Chloride (CH_2Cl_2) Acetone Carbon Disulfide 1,1-Dichloroethane (1,1-DCA) 1,1-Dichloroethene (1,1-DCE) trans-1,2-Dichloroethene 1,2-Dichloroethene (total) (total 1,2-DCE) Chloroform ($CHCl_3$) 1,2-Dichloroethane (1,2-DCA) 2-Butanone (MEK) 1,2-Trichloroethane (1,1,1-TCA) Carbon Tetrachloride (CCl_4) Vinyl Acetate Bromodichloromethane 1,1,2,2-Tetrachloroethane

1,2-Dichloropropane (1,2-DCP) trans-1,3-Dichloropropene Trichloroethylene (TCE) Dibromochloromethane 1,1,2-Trichloroethane Benzene cis-1,3-Dichloropropene Bromoform(CBr_4) 2-Hexanone 4-Methyl-2-pentanone Tetrachloroethene (PCE) Toluene (C_7H_8) Chloronbenzene (C_6H_5Cl) Ethyl Benzene Styrene Xylenes (Total)
Radionuclides (Dissolved)[f] Gross Alpha Gross Beta Radium-226; 228; (Ra-226, Ra-228) Uranium 233+234; 235; and 238 (U-233+234, U-235, and U-238) Strontium 89+90 (Sr-89+90) Cesium-134; 137 (Cs-134, Cs-137)
Radionuclides (Total) Americium 241 (Am-241) Plutonium 239+240 (Pu-239+240) Tritium

3.3 Data Evaluation For Industrial Area IM/IRA

To establish a baseline prior to decontamination & decommissioning (D&D) of buildings in the Industrial Area (IA) of RFETS, all analytical data for groundwater samples collected from the following wells were compiled and evaluated: 1986, 2186, 6186, P114589, P114689, P114789, P114889, P115489, P115589, P115689, P215789, P313489, P313589, P314289, P415889, P416289, P416389, P416589, P416689, P416789, P416889, P416989, and P419689. These data were retrieved from the Rocky Flats Environmental Database System (RFEDS) on February 15, 1996 and include all available data (1986-95) accumulated for these wells.

The RFEDS ASCII output was compiled as SAS® data sets and prepared following standard data-cleanup protocols. The initial SAS® data sets consisted of all data split into the four analytical suites (metals, radionuclides, organic compounds, and water-quality parameters). In the next generation (01-generation) of SAS® data sets, separate files were created for dissolved metals, total metals, dissolved radionuclides, total radionuclides, anions and water-quality parameters, herbicides\pesticides\PCBs and VOCs/SVOCs. The types of data in each file were assessed, then all rejected data (val=R) and all quality control (QC) data were removed from the next (02) generation of the working data sets. Additionally, all units were made consistent, all records without units or results were deleted, and the "hit" variable was defined. The "hit" variable is a binary code in which all nondetect data have hit=0, whereas all detect data have hit=1.

The number and percentage of detect and nondetect records were compiled by analyte for each of the 02-generation files; this compilation is included on diskette as file HITS_02.TAB (Table 3-2 Industrial Area IM/IRA Summary Statistics Diskette). The seven data files at this point are IA_FM02 (dissolved metals), IA_TM02 (total metals), IA_FR02 (dissolved radionuclides), IA_TR02 (total radionuclides), IA_WQ02 (anions & water-quality parameters), IA_HP02 (herbicides/pesticides/PCBs), and IA_UV02 (VOCs/SVOCs).

To compile summary statistics, a third (03) generation of the data files was created, in which a RESULT2 variable was created. For all files except radionuclides, if the record was indicated as detected, then RESULT2 = RESULT; however, if the record was qualified as a nondetect (i.e., qual = U), then RESULT2 = RESULT/2. Per DOE Order 5400.1, which states that for all radionuclide records the actual result should be used rather than a replacement value, the variable RESULT2 was set = RESULT for all radionuclide records. The 03-generation data files are included here on diskette as compressed, self-extracting SAS® files (v. 6.10 for Windows).

Data And Data Quality

The initial data files included QC types of FB (field blank), RNS (rinsate), UNKN (unknown), LR (lab replicate), MS (matrix spike), and MSD (matrix spike duplicate). Rejected data (val=R) comprised a small percentage (0.1% to 4.3%) of the overall records for each analytical suite. Total radionuclides had the greatest percentage of rejected records (4.3%), whereas herbicides/pesticides/PCBs had the lowest percentage (0.1%). Overall detection rates were 35.5% for dissolved metals, 60.4% for total metals, 76.9% for dissolved radionuclides, 84.0% for total radionuclides, 77.7% for anions and water-quality parameters, 0.00% for herbicides/pesticides/PCBs, and 4.5% for VOCs/SVOCs. The detection rate by analyte is provided as tables on diskette (file HITS_02.TAB).

3.4 Summary Statistics and Shewhart Control Charts

Summary statistics were compiled by analyte for each monitoring well using the RESULT2 variable in the 03-generation data files. No distributional testing was performed for each analyte, so the summary statistics are based on the assumption of normality for all analytes. In addition, the nondetect rate was not used to screen out analytes for the statistical calculations. Because of these two simplifications to statistical analysis, the future data user should be certain to assess the nondetect rate and distribution for each analyte prior to uncritically accepting the summary statistics provided here. The tables of summary statistics are voluminous, and are therefore provided on diskette (Table 3-2 Industrial Area IM/IRA Summary Statistics Diskette) as compressed, self-extracting ASCII files. To access the output, merely transfer the *.EXE files to a hard drive, then type the file name (without typing the EXE extension) or double-click on the file name. The file will expand within the directory where it is located.

In addition to the summary statistics, Shewhart control charts were created for selected analytes in selected wells. Figure 3-2 through Figure 3-20 are included at the end of this section. Basically, the Shewhart charts show the intrawell concentration/activity of each analyte over time, along with the upper and lower confidence limits (95% UCL and 95% LCL, respectively) of the mean concentration. Detects and nondetects are indicated on the charts by different symbols. The Shewhart charts show fluctuations and trends in the concentrations or activities of each analyte.

To select wells and analytes for which to construct Shewhart plots, each data file was sorted by analyte and result; the output was then reviewed for those locations having the highest concentrations or activities for each analyte. From the VOC/SVOC data file, carbon tetrachloride; chloroform; 1,1,1-trichloroethane (1,1,1-TCA); 1,1-dichloroethane (1,1-DCA); 1,1-dichloroethene (1,1-DCE); tetrachloroethene (PCE); trichloroethene (TCE); vinyl chloride; cis-1,2-dichloroethene (cis-1,2-DCE); and trans-1,2-dichloroethene (trans-1,2-DCE) were selected as analytes for review. Not all Shewhart plots created were saved as figure files; only those plots deemed useful and informative are presented here. A number of Shewhart plots for VOCs are included here; however, the plots for dissolved metals and radionuclides showed generally background levels for these analytes, and are not included with this evaluation.

3.5 Evaluation Of Contaminants

In 1995 the Well Evaluation Project evaluated data from all wells at RFETS to determine the extent of contaminant plumes in groundwater and evaluate the monitoring network in terms of spatial location of wells with respect to these plumes. Figure 3-1 (RFETS Industrial Area IM/IRA Gaging Station Network: Surface Water Verification Monitoring Locations)shows a plot of composite volatile organic plumes for the Site. The organic compounds that make up the composite plume are TCE, PCE, carbon tetrachloride and vinyl chloride. It can be seen from the map that an extensive VOC plume exists in the central industrial area. The purple area of the plume map is based on exceedances for any of the above parameters over the National Drinking Water Standard Maximum Concentration Levels, or MCLs. MCLs for these parameters are .005 ug/l for TCE, .005 ug/l for PCE, .005 ug/l for carbon tetrachloride and .002 ug/l for vinyl chloride. The green portion of the plume represents excedances in groundwater over 100 times the MCL. These two VOC concentration limits are currently proposed as action levels in the "Conceptual Plan for the Management and Remediation of Groundwater at RFETS". The areas above 100 times the MCL would be considered a Tier 1 action level and the MCL limit would be a Tier II action level. Other parameters such as radionuclides and metals are generally within background levels, with the possible exception of barium. Included on the VOC map are probable groundwater flow directions as interpreted from potentiometric surface data.

3.6 IA Groundwater Contaminant Plume

The IA contains a coalesced plume of contaminated groundwater containing trichloroethene thought to emanate from IHSSs 117.1, 117.2, 157.1, 158, and 171; tetrachloroethene thought to emanate from IHSSs 117.1, 117.2, 158, 157.1, 160, and 171; and carbon tetrachloride thought to emanate from IHSSs 117.1, 117.2, and 158. This coalesced plume southwest of Building 559, is outside of the fenced portion of the protected area (PA) and extends downgradient towards the central portion of the PA.

Currently, the groundwater contaminant plume does not appear to be moving, and there are no known or potential surface water impacts. Proposed remedial actions include removal of soils containing contamination above the Tier-I action level where feasible, and installation of a soil vegetative cover to limit natural recharge and contaminant leaching, with continued monitoring of the groundwater contaminant plumes. Groundwater recharge in the IA caused by water losses from sewers and water supply pipelines, as estimated from water budget studies from surface water monitoring activities, is between 7 and 26 million gallons per year. Reduction of recharge from these sources could significantly reduce the potential for contaminant migration in the subsurface.

Other alternatives under consideration for remedial actions include diverting groundwater flow upgradient of the IA, and collecting contaminated groundwater within the IA by linking footing drains on selected buildings with new sections of horizontal drains connected to the existing treatment facility in Building 891. Preliminary calculations indicate that only 15 percent of the present recharge (precipitation plus groundwater influx) to the IA could be diverted by an upgradient barrier. Preliminary calculations also indicate that an upgradient barrier would divert only 3.6 gallons per minute of groundwater flux from entering the IA.

Treatment of contaminated groundwater within the IA does not appear to be necessary to protect surface water, as the plume appears to have limited potential for migration. However, ongoing monitoring and evaluation of the groundwater through the monitoring program will continue, and will detect if movement or expansion of the plume is occurring. Groundwater remedial actions may become necessary if the contaminant plumes increase significantly and become a threat to surface water.

3.7 Current Activities

Current activities for the groundwater portion of the IM/IRA are to install five of the eleven proposed wells in the Decision Document in spring, 1996. Figure 3-1 (RFETS Industrial Area Wells With Composite Plume Extent Map) shows the location of the five monitoring wells. These well locations were chosen because they fit with the current strategy of monitoring potential releases to surface water at the perimeter of the IA as opposed to monitoring the interior. Because building D&D activities have been deferred to later years, no well points are identified for installation in 1996. Quarterly monitoring will be done on these five wells to add to the baseline water quality profile for the industrial area.

A number of activities involving groundwater monitoring integration are currently underway. The Groundwater Strategy Workout Group is negotiating points of compliance and monitoring standards with the agencies for groundwater at RFETS based on plume configuration and potential impact to surface water. The IM/IRA wells are considered part of the Site groundwater network and will be included in future Sitewide groundwater decisions. The current strategy is based on an action level framework whereby areas of groundwater contamination would be remediated based on the tiered approach described earlier.

The monitoring program is also involved in summarizing and evaluating the data quality objectives (DQOs) for various groundwater elements including the IM/IRA. The general effect of these activities is that the industrial area IM/IRA will be integrated with the Site vision for remediation and monitoring.

Figure 3-2 RFETS Shewhart Control Charts

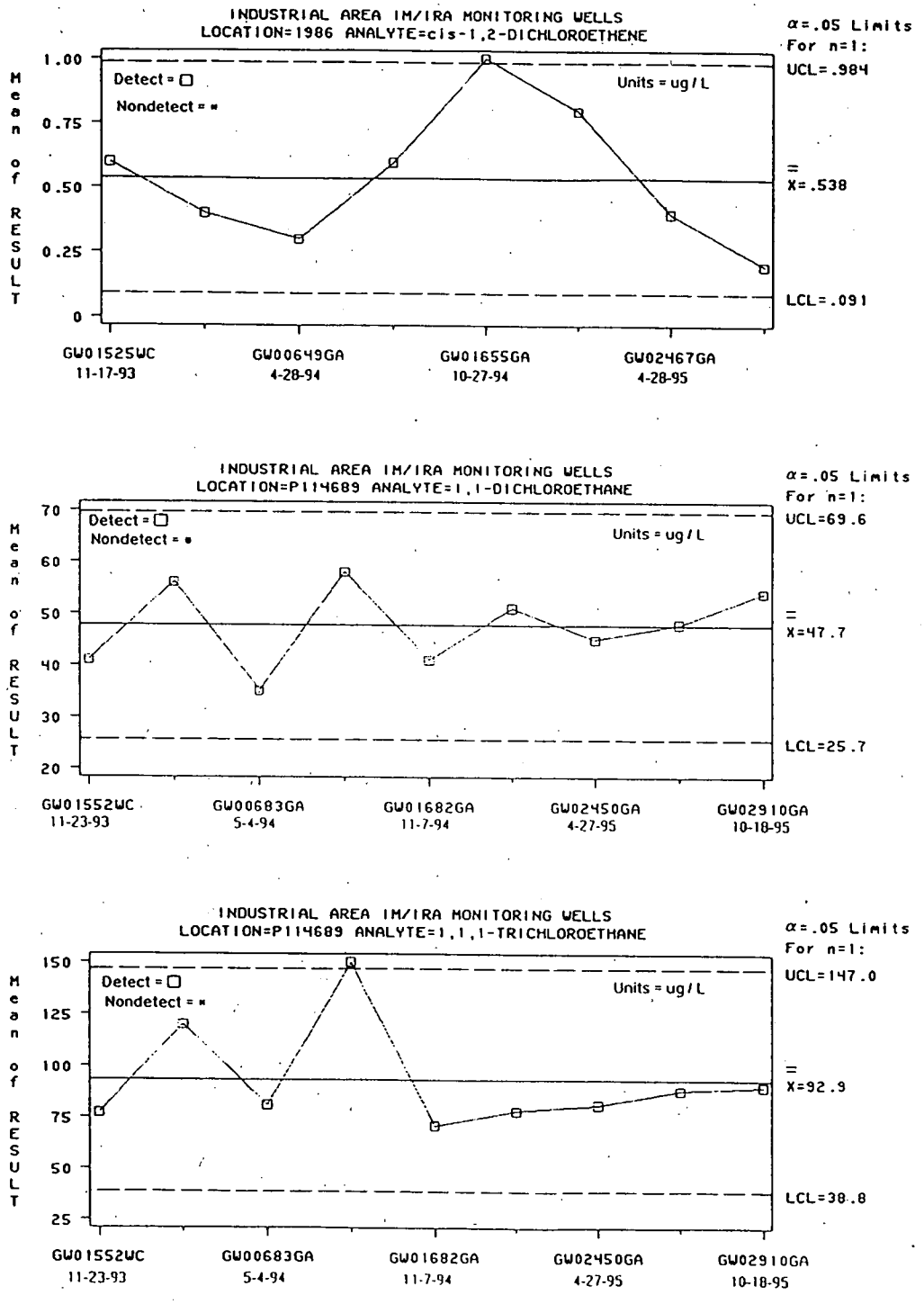
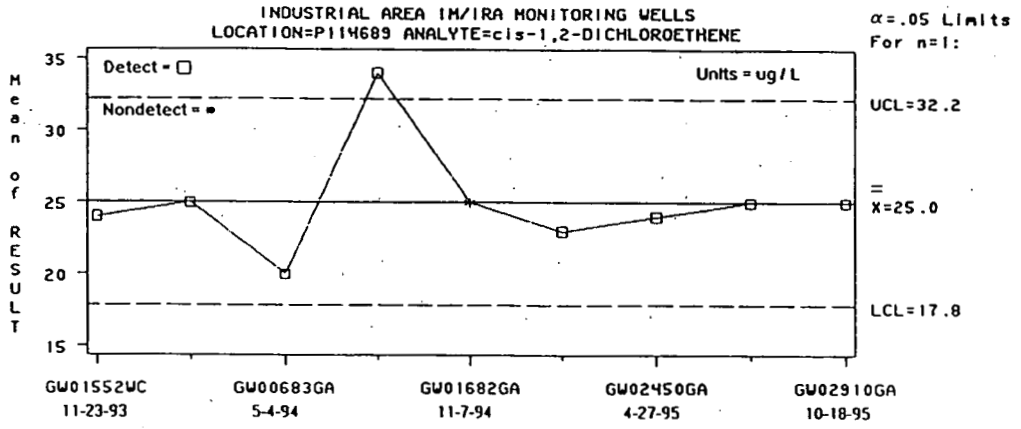
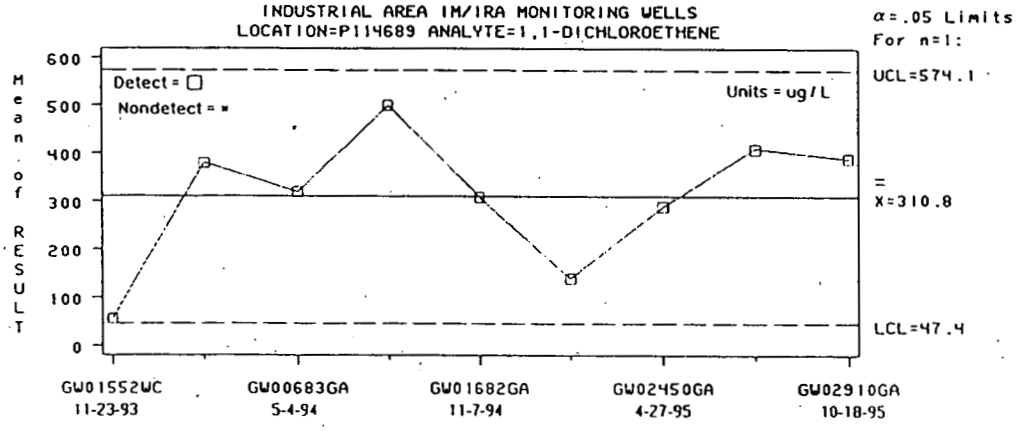
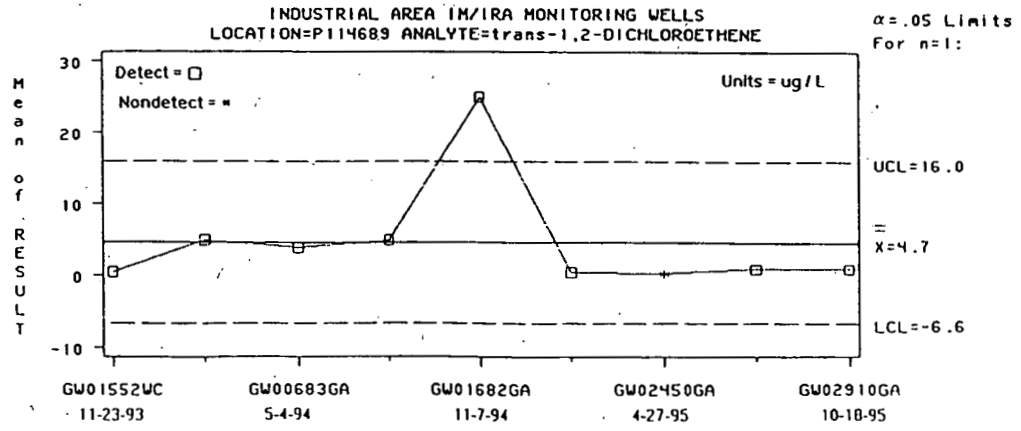


Figure 3-3 RFETS Shewhart Control Charts







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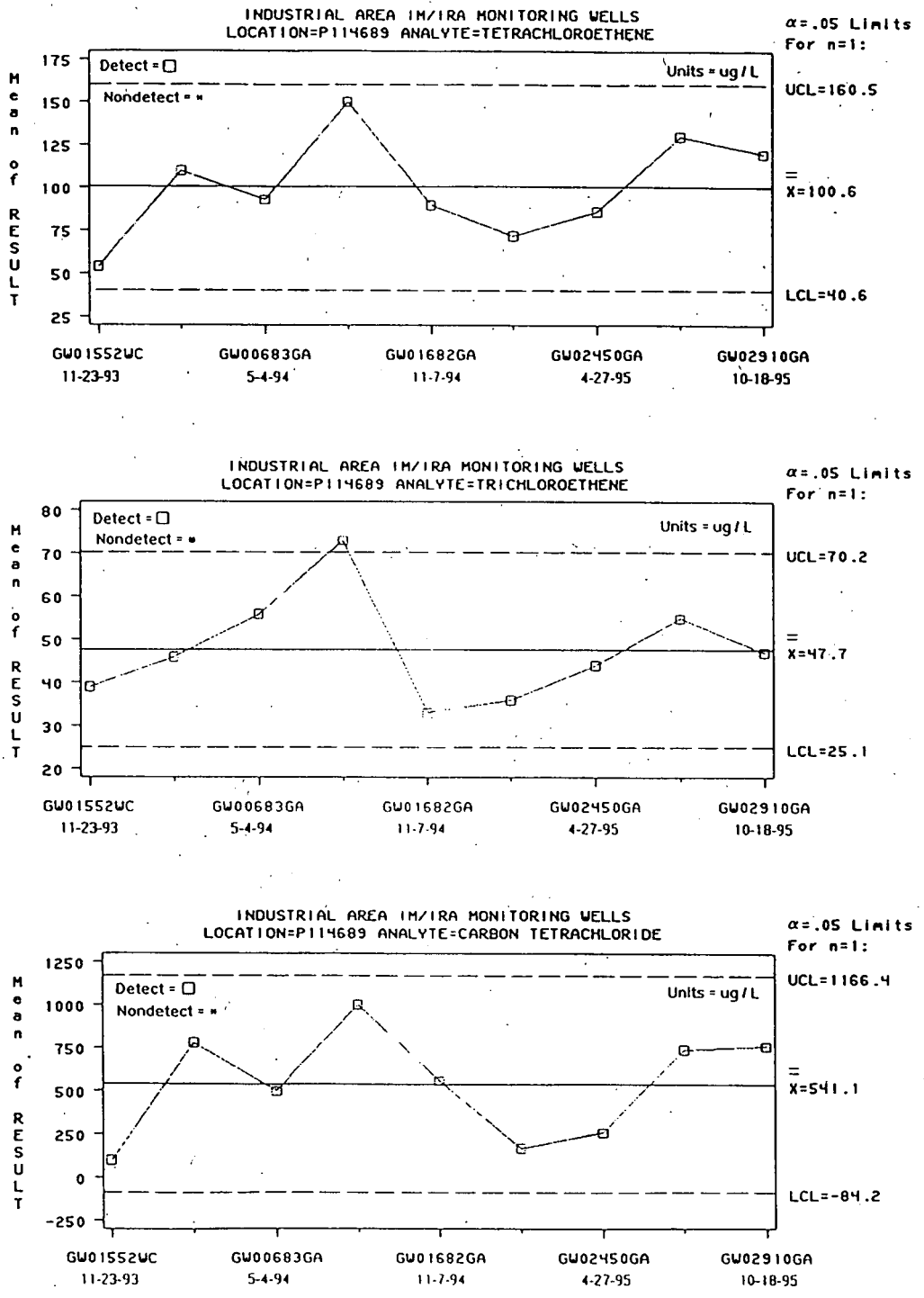
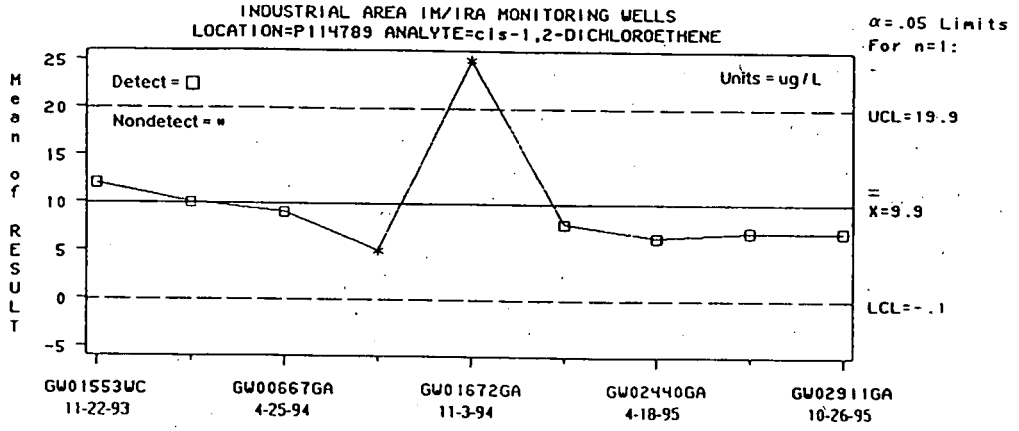
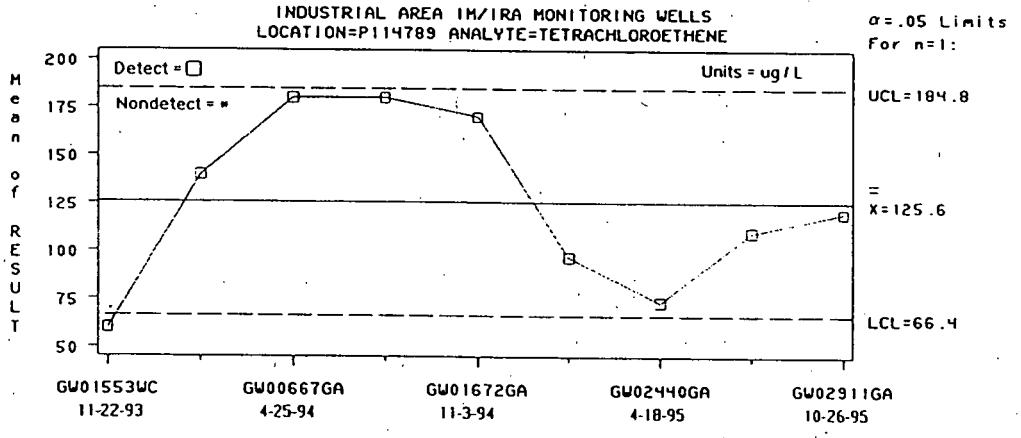
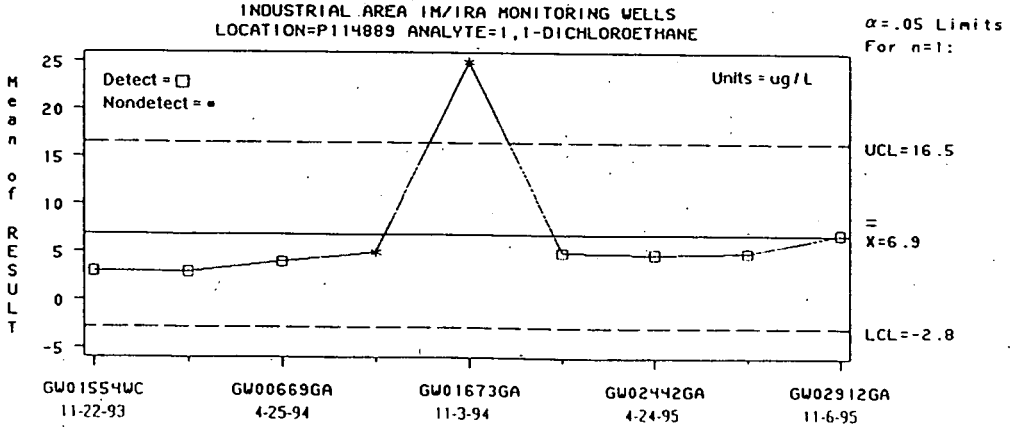


Figure 3-5 RFETS Shewhart Control Charts







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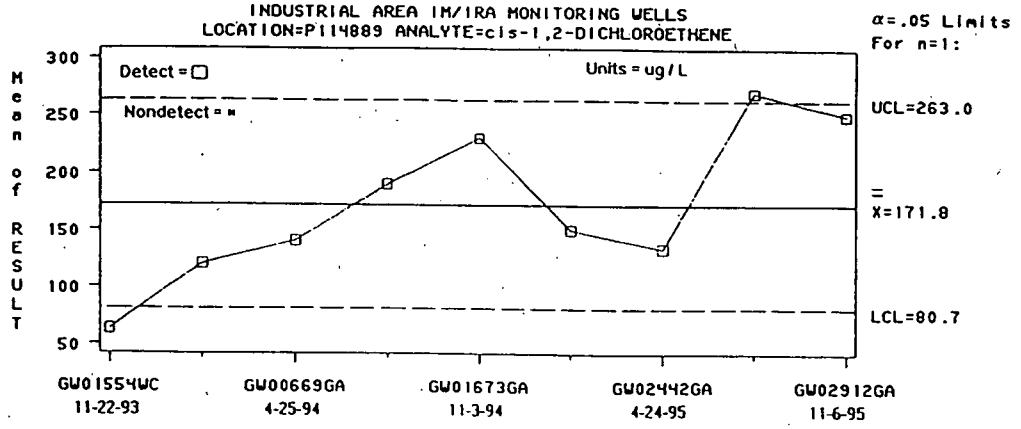

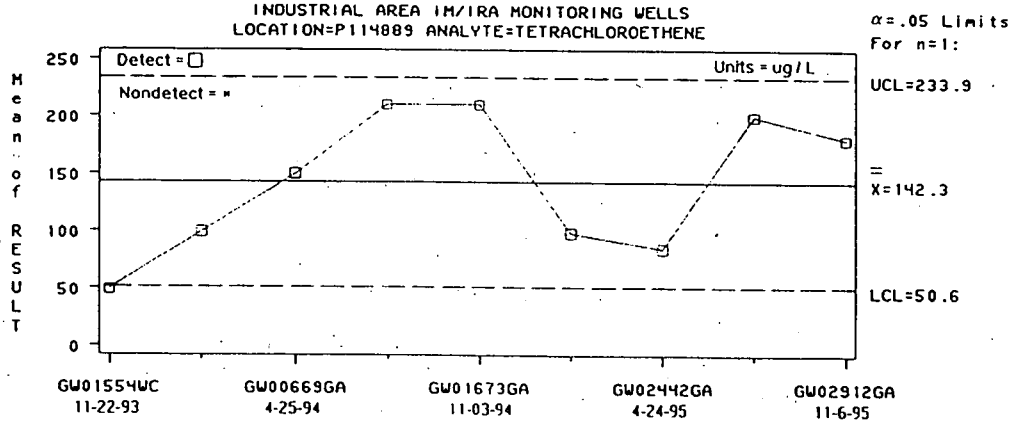

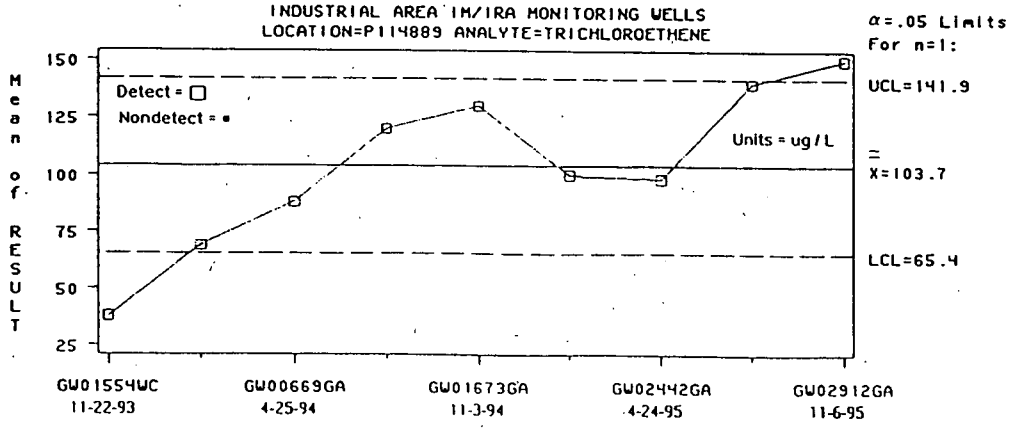

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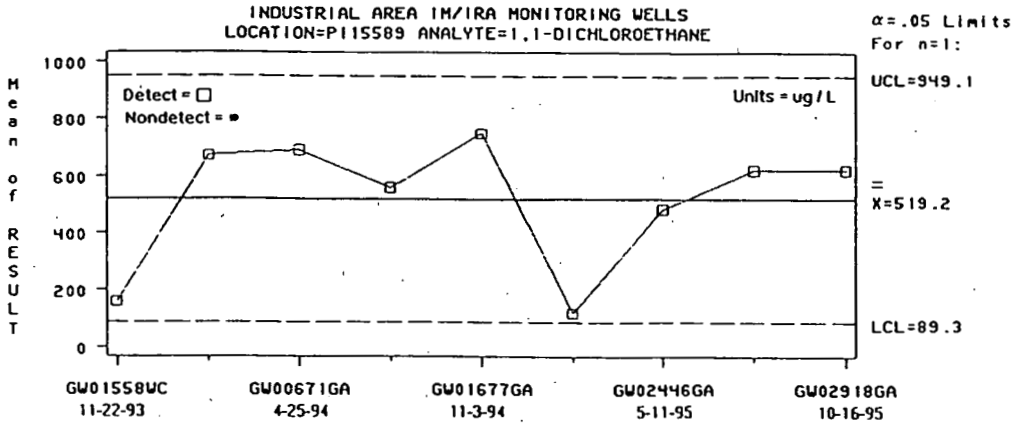

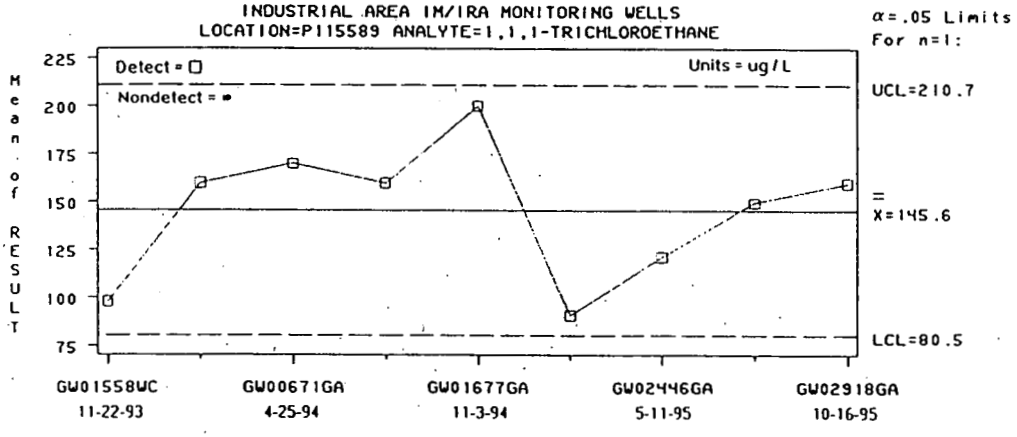

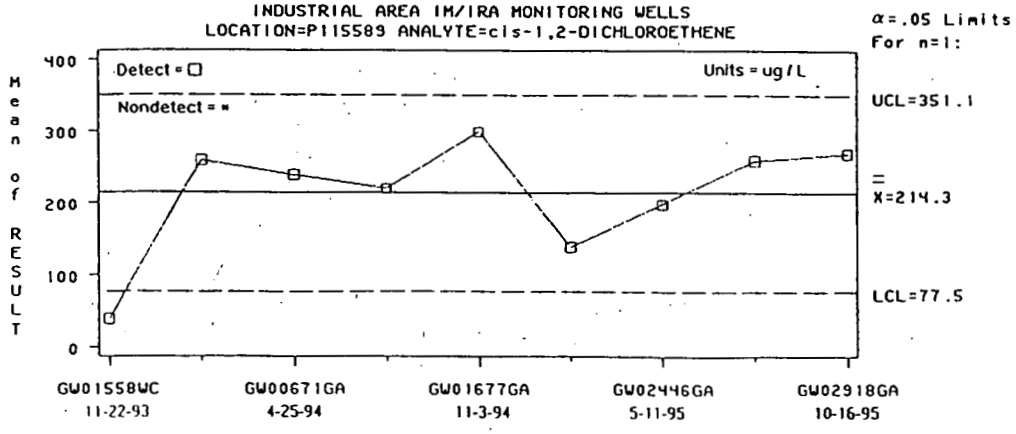

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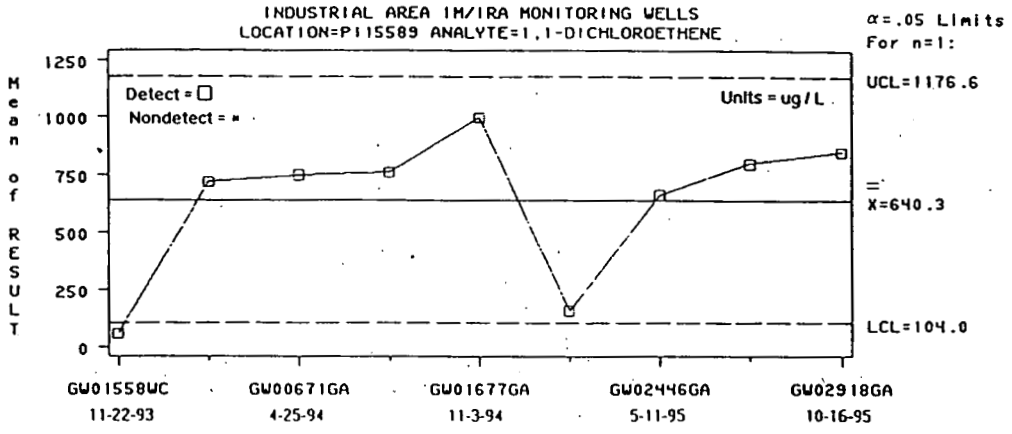

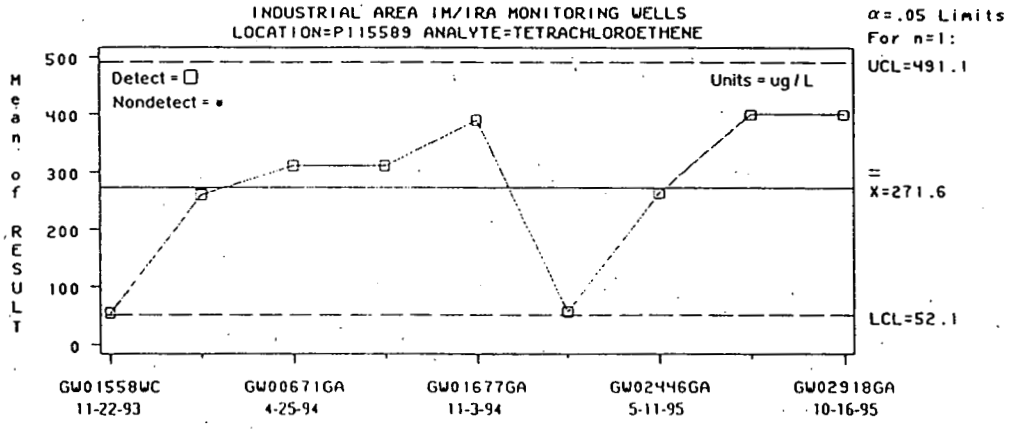

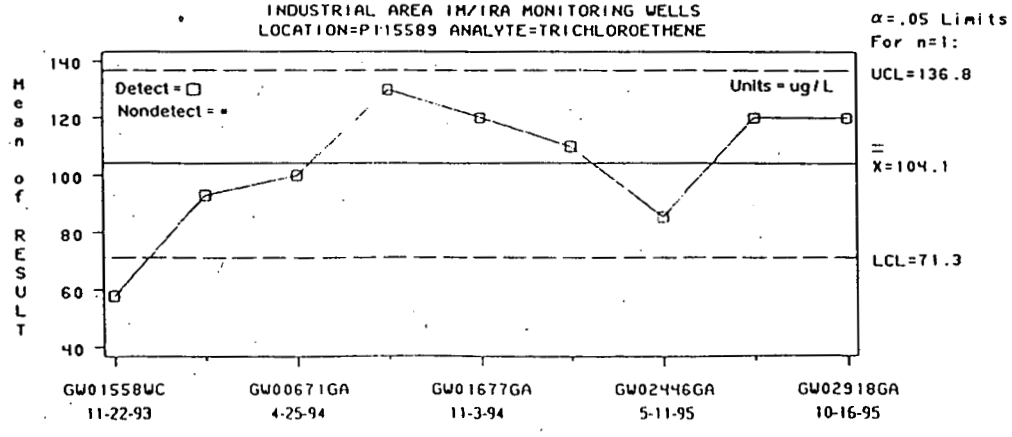

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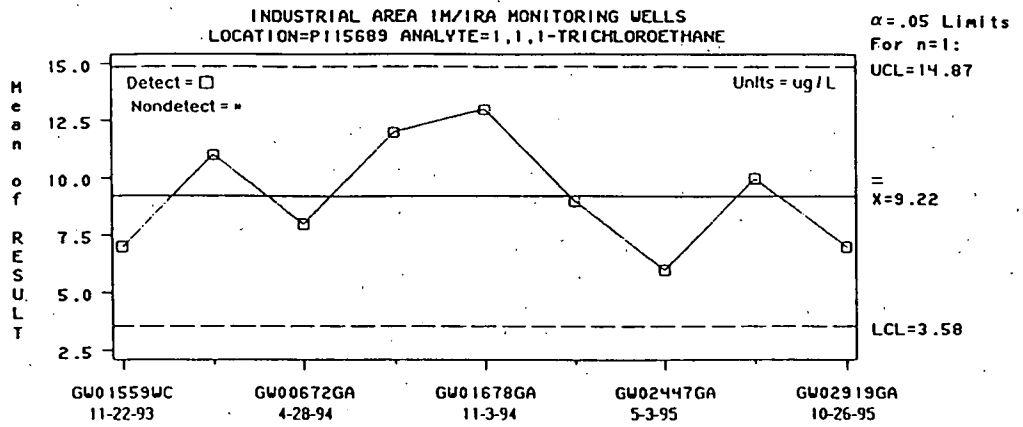
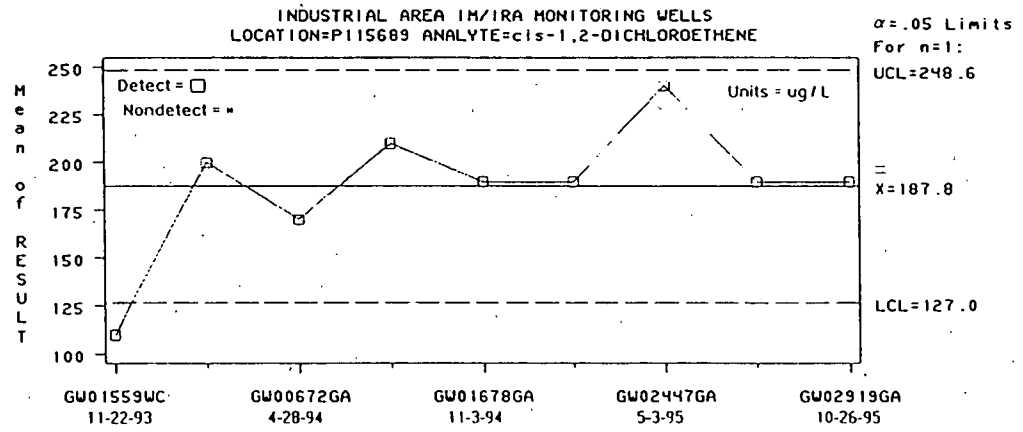




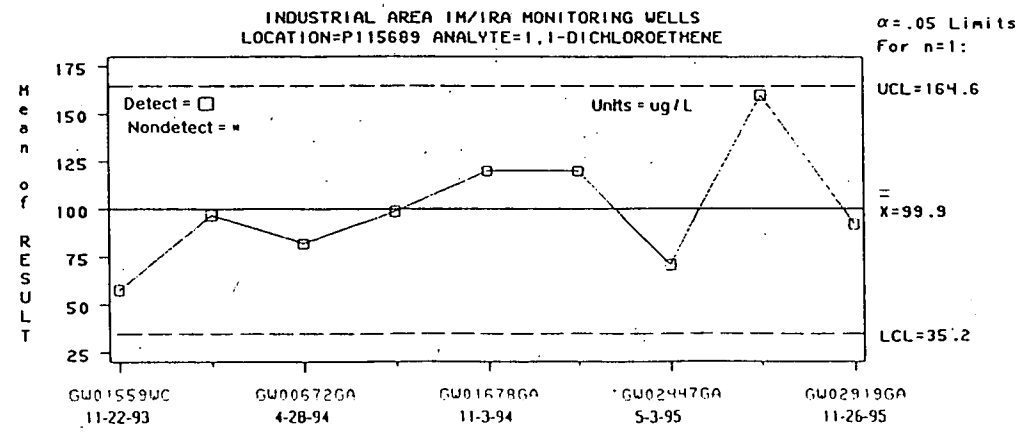
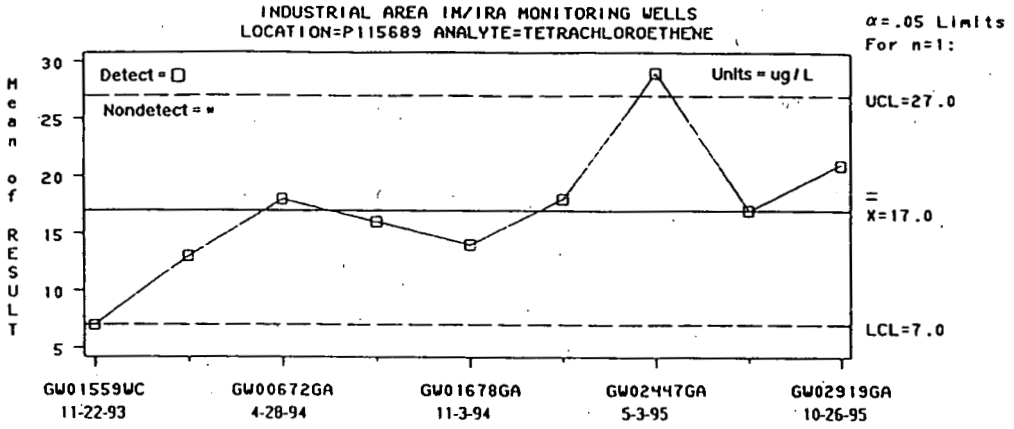
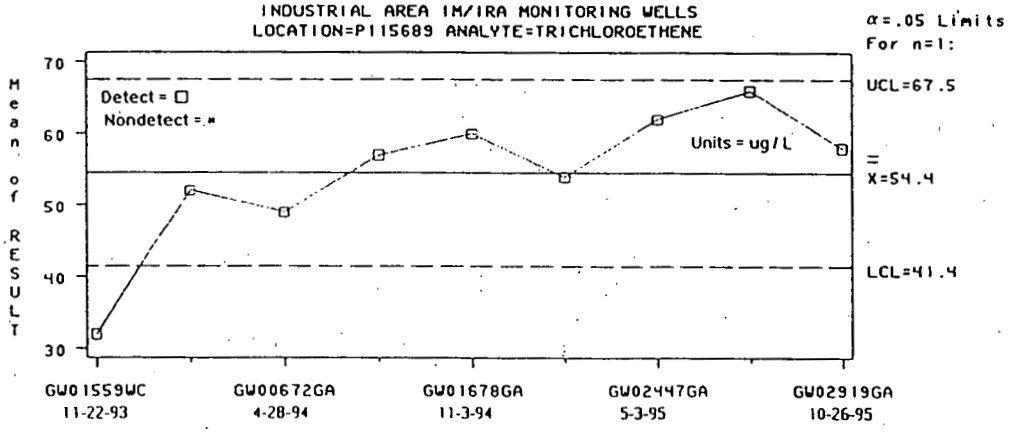
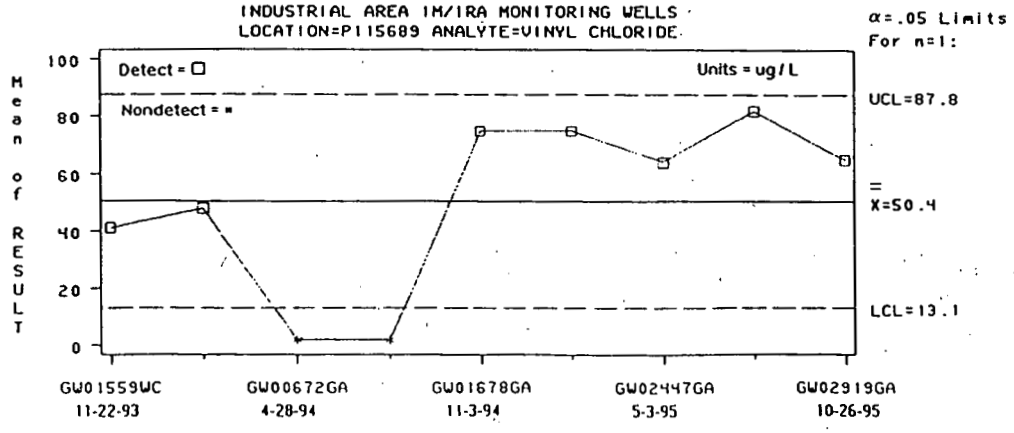


Figure 3-10 RFETS Shewhart Control Charts







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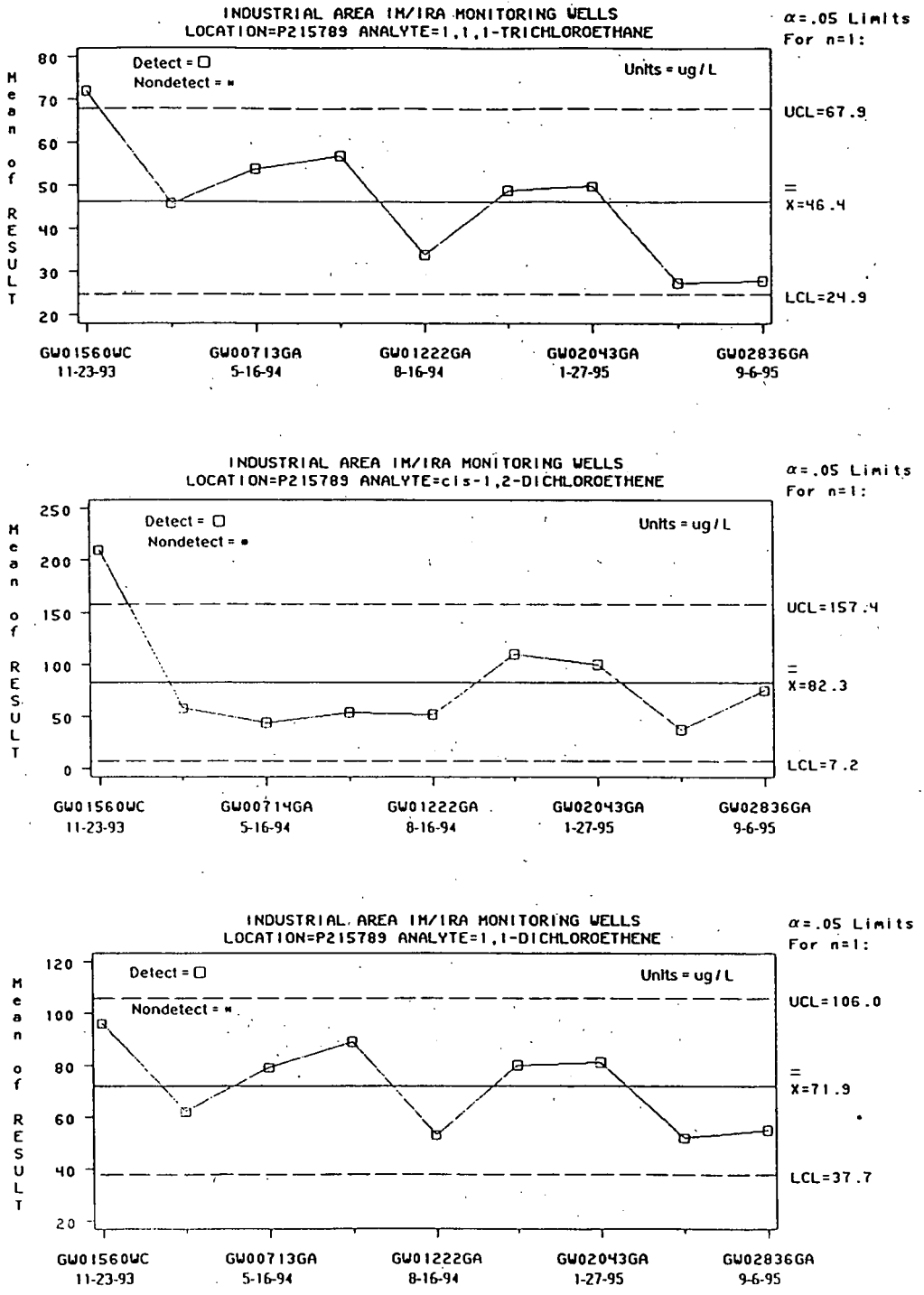

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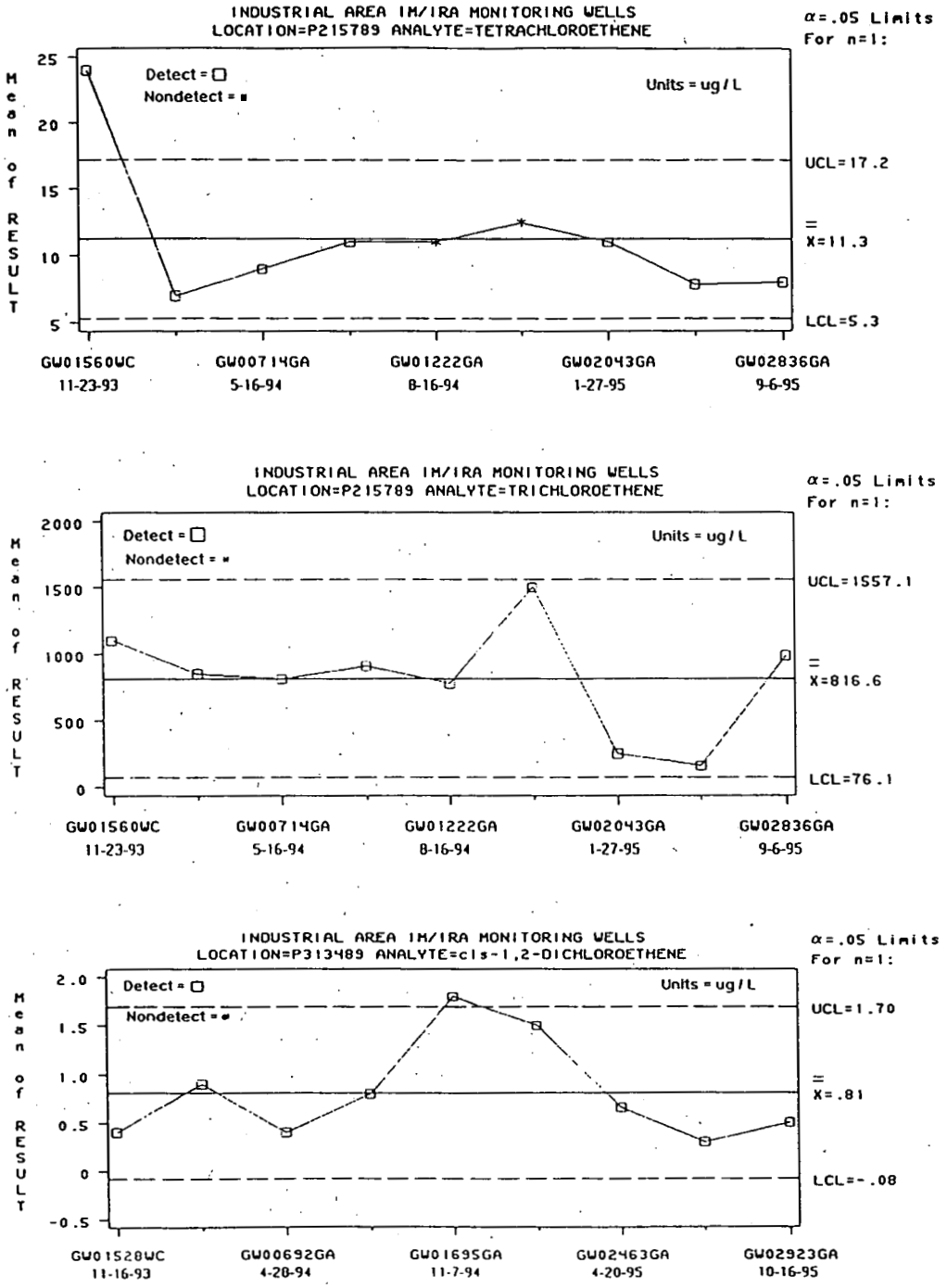

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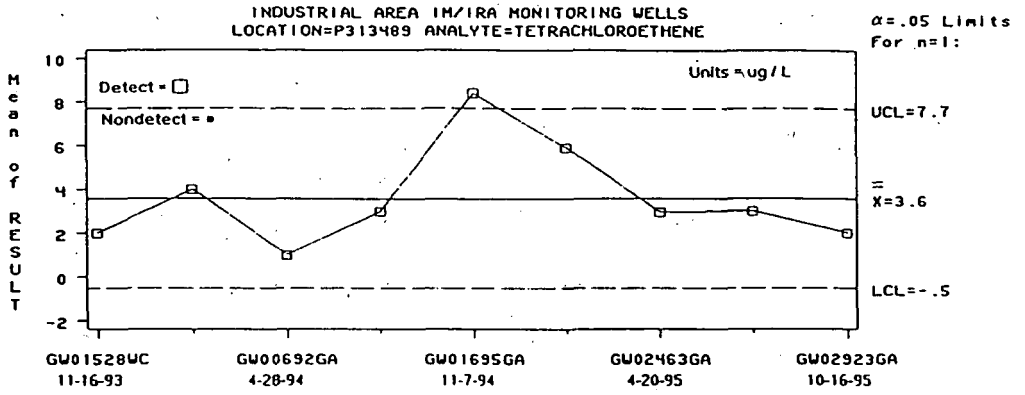

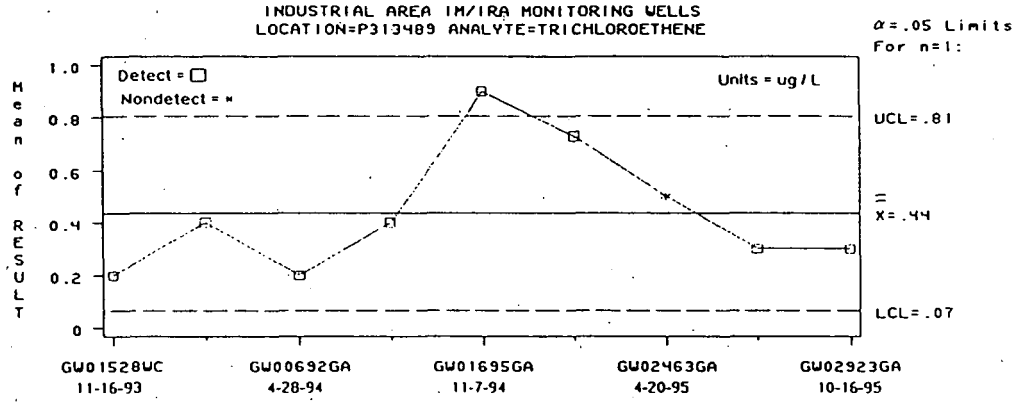

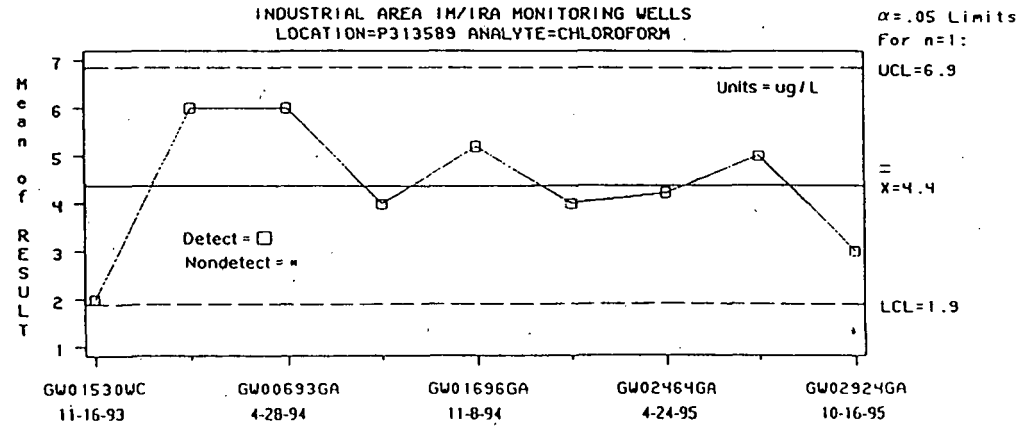

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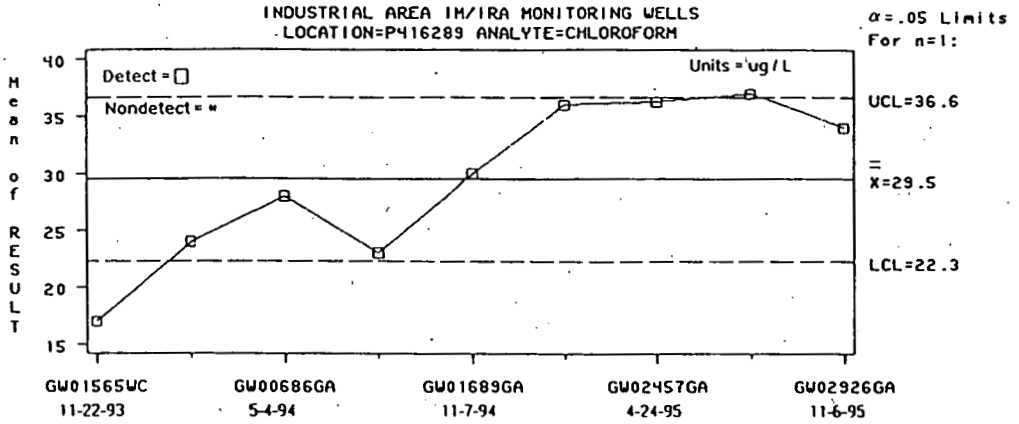

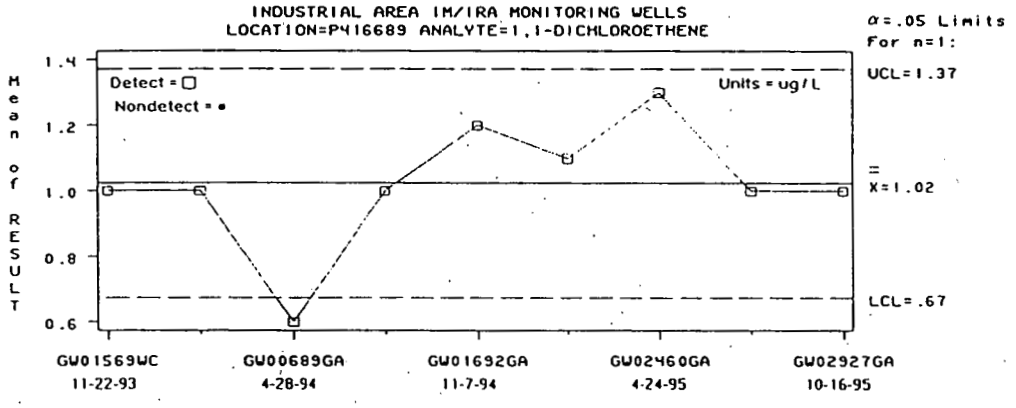

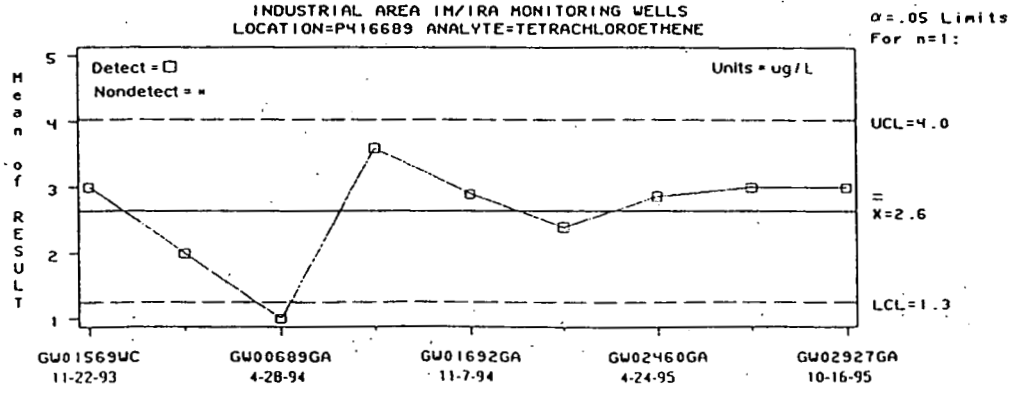

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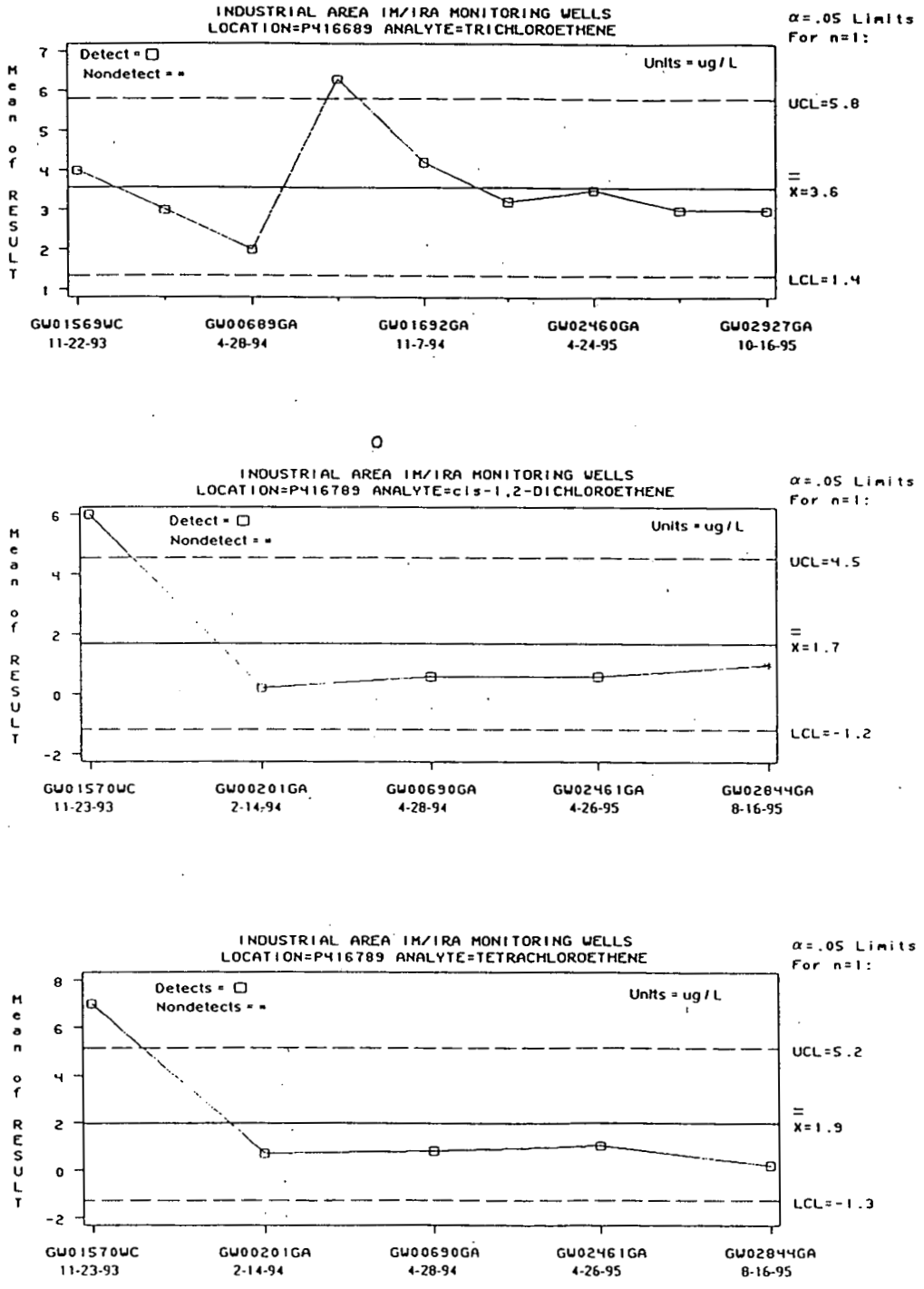
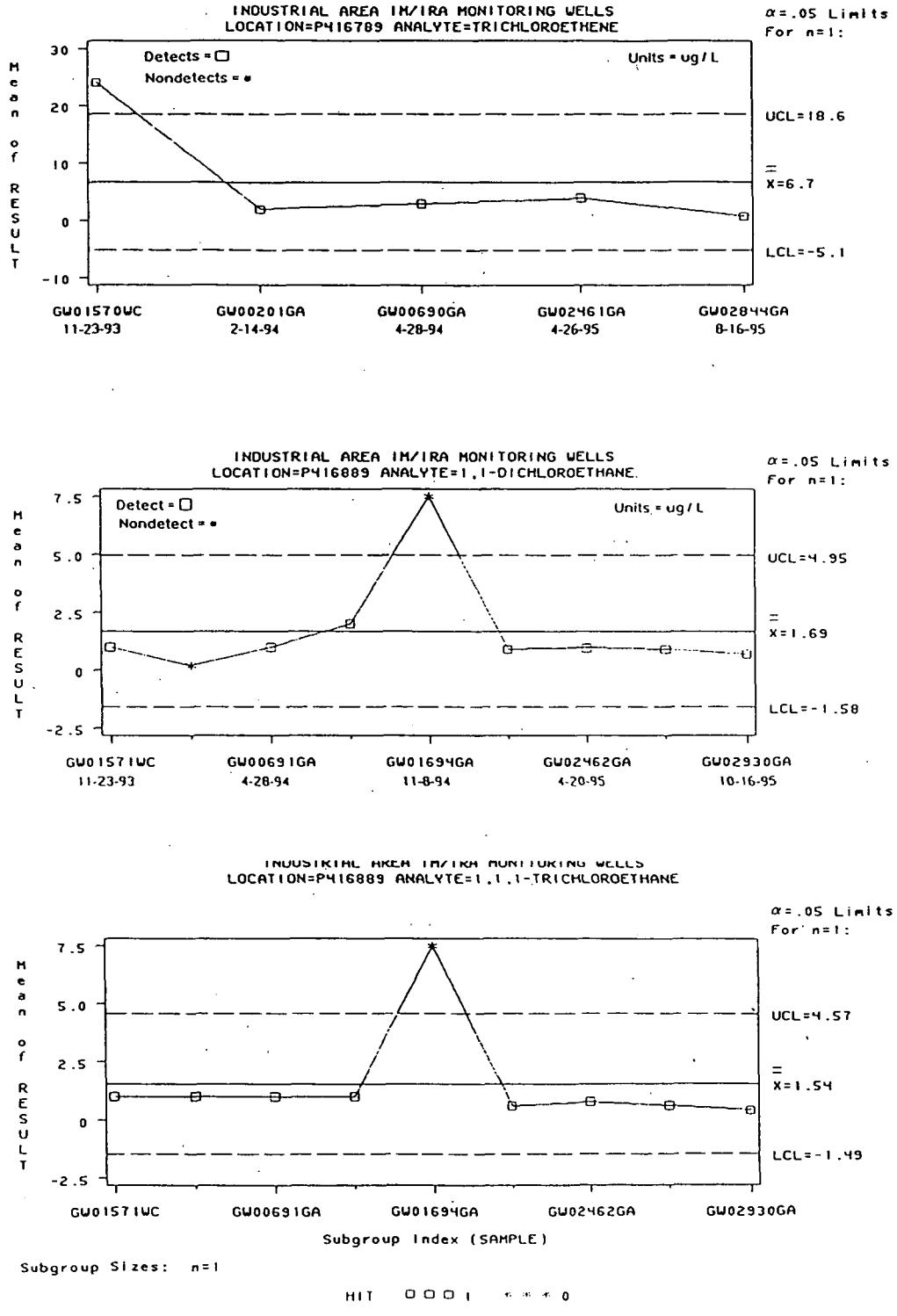


Figure 3-16 RFETS Shewhart Control Charts



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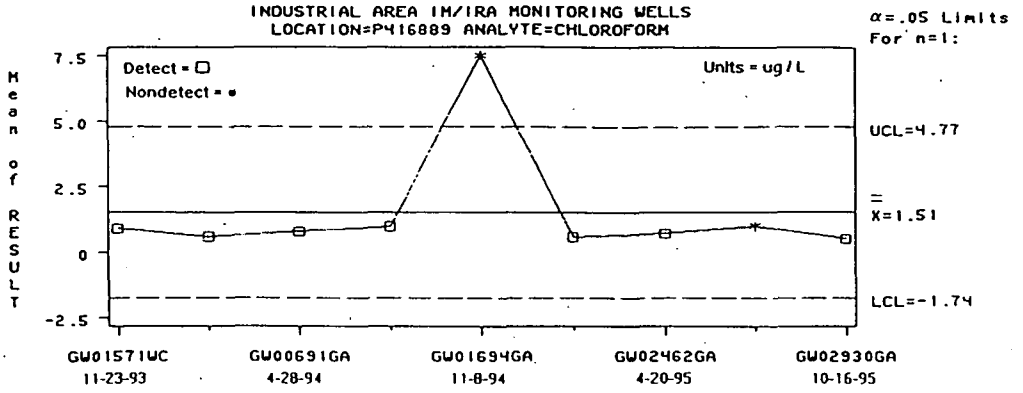

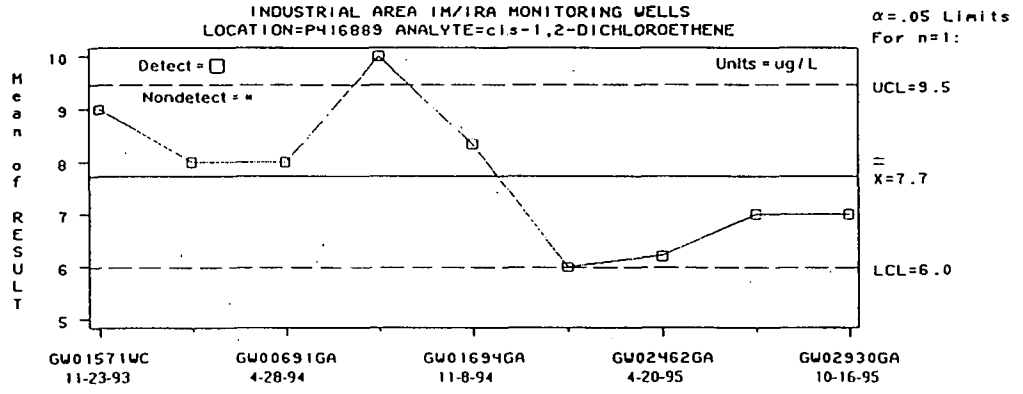

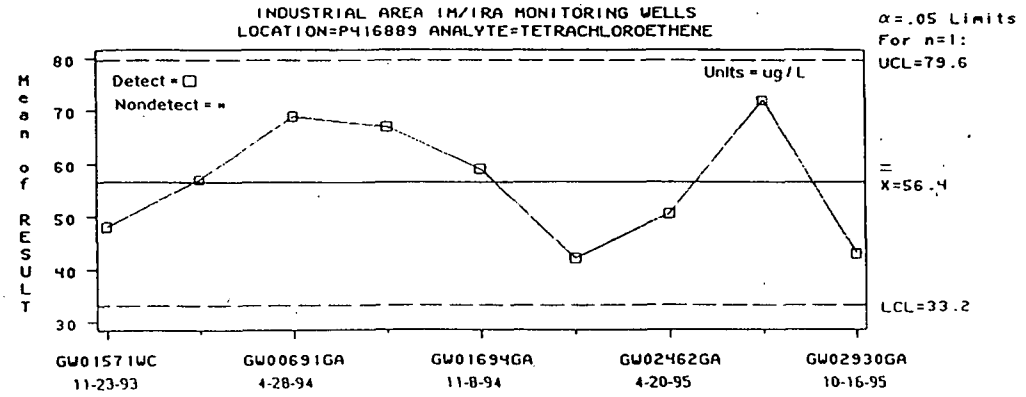

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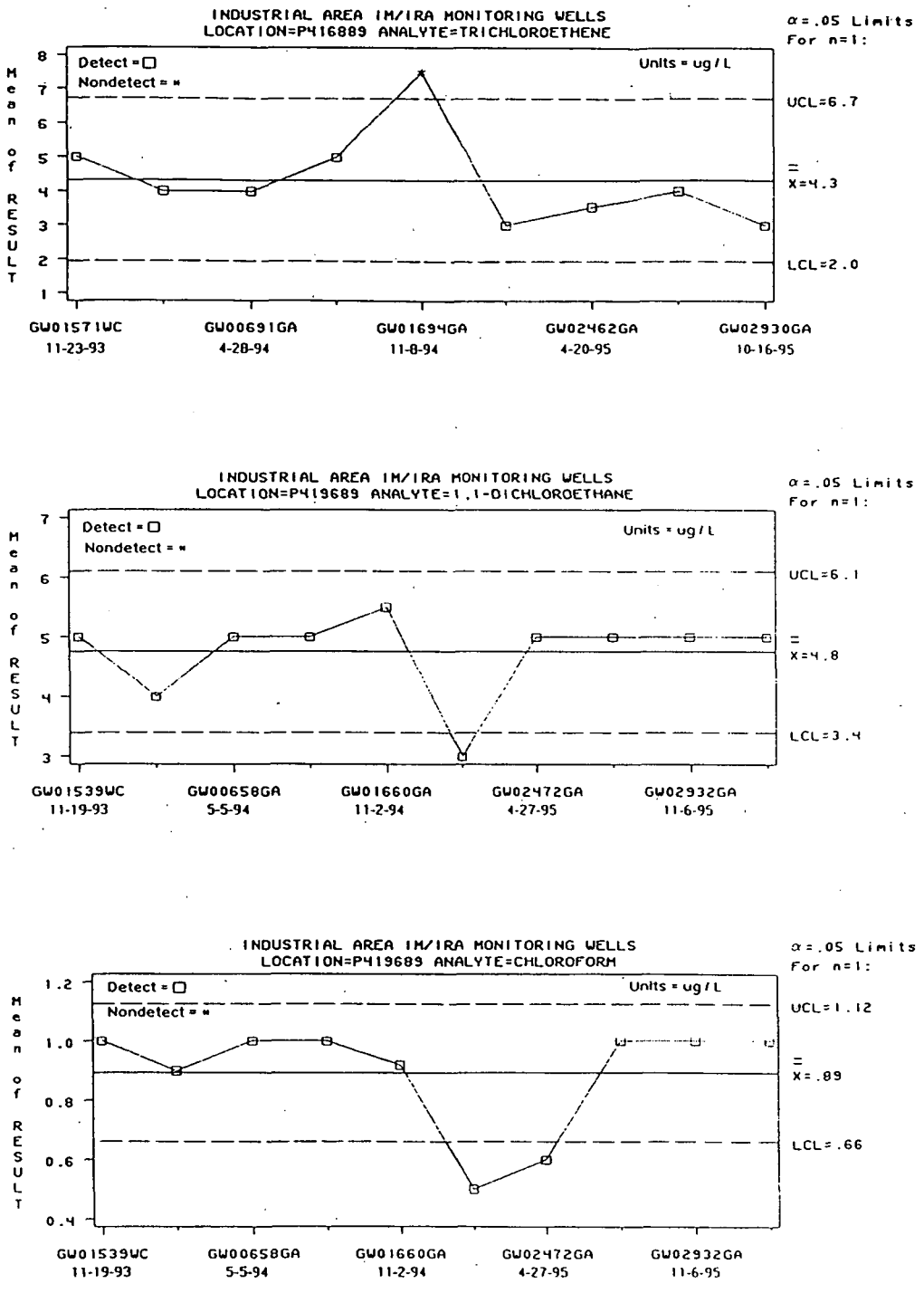
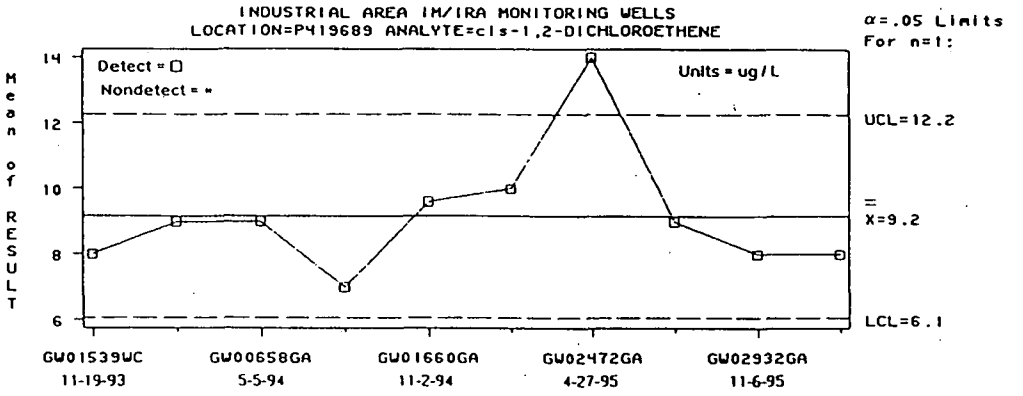
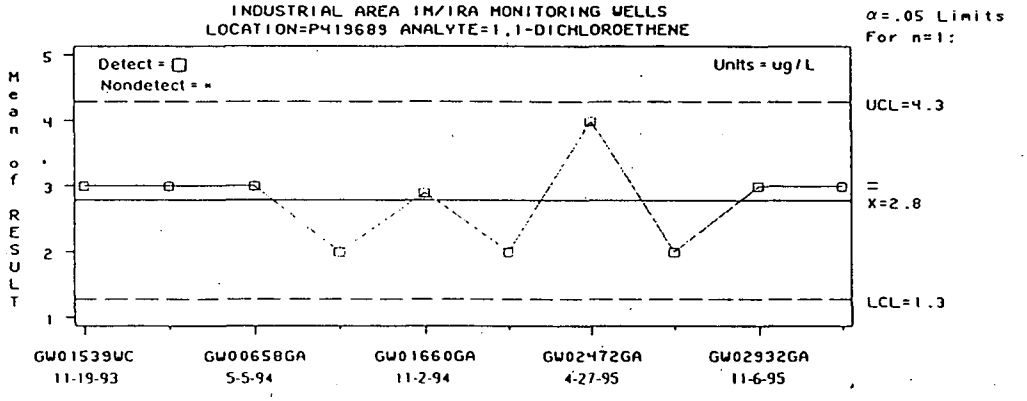


Figure 3-19 RFETS Shewhart Control Charts





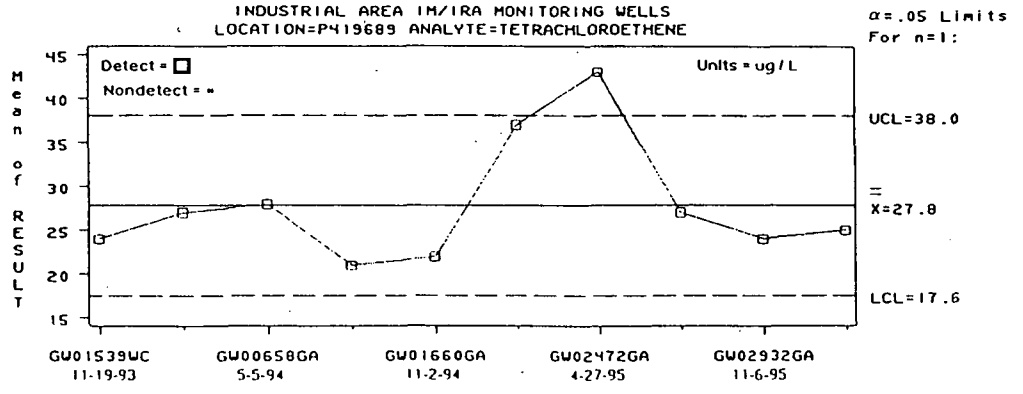


Figure 3-20 RFETS Shewhart Control Charts

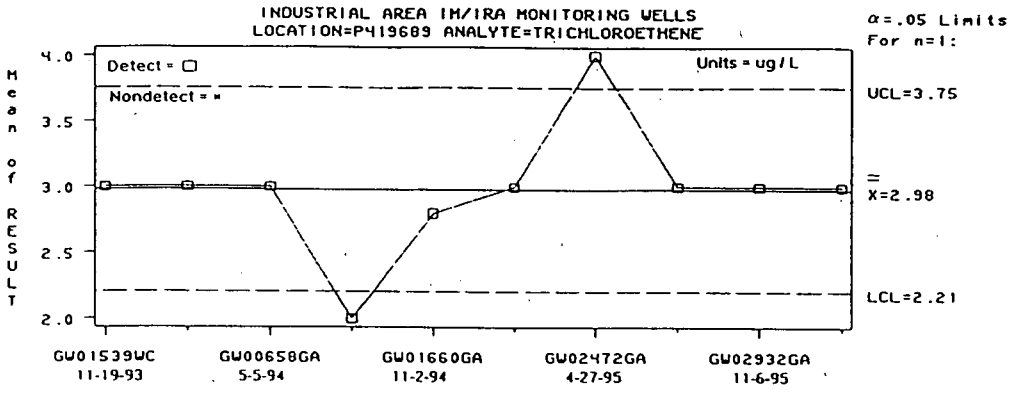
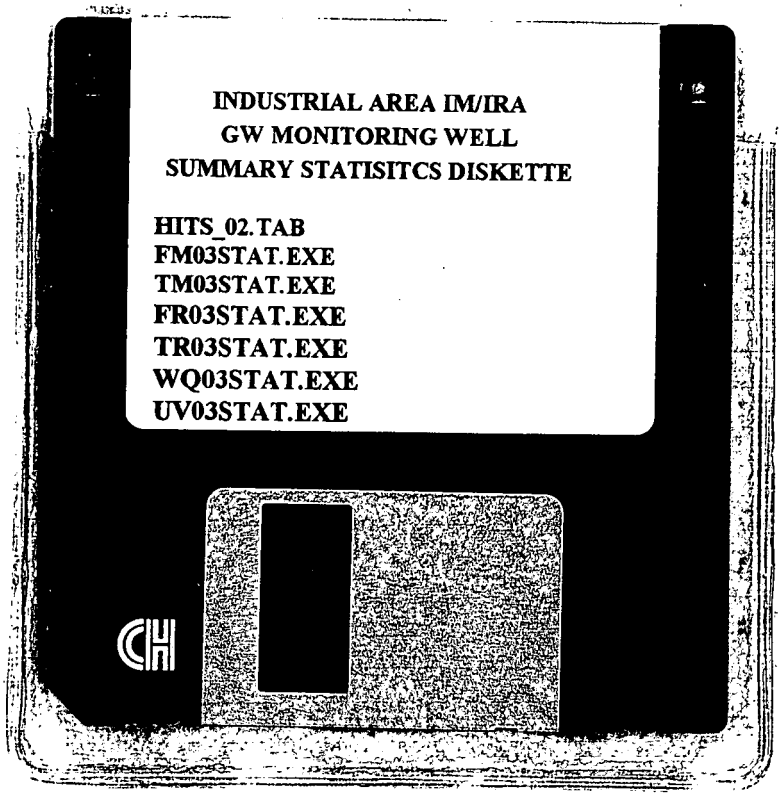


Table 3-2 Industrial Area IM/IRA Summary Statistics Diskette

IBM FORMAT

See Paragraph 3.4 for disk access information



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4. AIR MONITORING PROGRAM

4.1 Introduction

As part of the Final Interim Measures/Interim Remedial Action Decision Document for the Rocky Flats Industrial Area, November, 1994 (Decision Document), an ambient air monitoring network was implemented along the perimeter of the Rocky Flats Environmental Technology Site (Site) Industrial Area to determine baseline concentrations of volatile organic compounds at the Site. Constituents of Potential Concern, and Compounds of Interest were listed in Section 3.0 of the above document and provided the foundation for the analyte list for this monitoring network. Additional review of the Site's chemical inventory, Air Pollution Emission Notices (APEN), and OU's 1 and 2 field data were conducted which ultimately resulted in list of 32 volatile organic analytes for this baseline project. The Decision Document proposes a secondary monitoring program (Verification Monitoring) during Decommioning and Decontamination (D&D) operations, that will supplement the existing environmental programs and provide surveillance coverage for potential chronic releases not otherwise detected.

This stage of the air monitoring project entails collection of sufficient ambient data to establish a Site baseline for ambient concentrations of volatile organics compounds (VOCs). A 12-month study period was selected to ensure representative data collection and to develop a statistically significant sample set for data assessment.

Network design, sampling and analytical methodologies were selected based upon Environmental Protection Agency (EPA) guidance for air sampling at Superfund Sites (1, 2, 3, 4). The Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, March 1994 (6) provided the foundation for project methodology. This document lists fourteen procedures for the collection of toxics in ambient air according to their physical characteristics and their detection ability using various analytical methods. Method TO-14 Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA® Passivated Canister Sampling and Gas Chromatography Analysis was selected for this project.

4.2 Monitoring Project Description

As a precursor to conducting verification air monitoring during Site D&D activities, a baseline establishing the concentrations of Compounds of Potential Concern was required. Baseline data are essential to establish action levels for verification monitoring. Proposed actions for the verification monitoring program were presented in Sections 4.0, 5.0, 6.0, and 7.0 of the IA IM/IRA Decision Document. When these proposed actions are implemented, either acute or chronic releases may be detected as they leave the Industrial Area based on the baseline data set that will be available for comparison.

Sampling network design balanced of cost effectiveness with data quality objectives. Five sampling sites were selected.

Figure 4-1 (RFETS Industrial Area IM/IRA Air Monitoring Stations) includes a map detailing the locations of the ambient samplers:

- Site # S-205 - Southeast of the core Site, adjacent to OUs 1 and 5;
- Site # S-008 - East of the core Site, the 903 pad, and the 800 Area;
- Site # S-301 - East of the Protected Area and the 700 complex;
- Site # S-104 - North-northeast of the core Site and solar ponds;
- Site # S-116 - West of core Site, project upwind sampler.

All five locations are existing sampling sites for the collection of ambient radiological particulates. Previous siting and modeling studies have identified these locations as being representative for the collection of air quality data from the industrial area. On-site meteorological data is continuously measured at three levels using a 61-meter tower located in the north-west quadrant of the Site. Although original planning identified ambient sites S-123 and S-110 as candidates (see Figure 6-1 in the Decision Document), S-123 was determined to be too far away to collect representative, low levels of VOCs from the industrial area. Site S-110, at the time of project design, had limited access due to OU-1 activity and the ability to collect weekly samples was in serious doubt. Therefore, the south-east quadrant monitoring is being covered by a sampler located at S-008. Samplers S-205 and S-301 are also downwind samplers. Sampler S-104 covers the northern quadrant, which may collect emissions during southerly wind patterns or during strong building downwash from the 700 complex. Sampler S-116 is the background sampler and is typically upwind of all expected sources.

As indicated above, compendium Method TO-14 was the preferred sampling and analysis methodology chosen for this baseline effort. Using Method TO-14, samples are collected in SUMMA® polished (passivated internal surface) , 6-liter stainless steel canisters using an automatic, microprocessor-controlled sampling system which includes a programmable timer, solenoid valve, flow controller and sample pump located within a temperature-controlled container (Model AGS-1/D, Scientific Instrumentation Specialists, Moscow, ID). Elements of EPA Method TO-14 include:

- Stainless steel canisters;
- Canister cleanup procedures;
- Sampler design;
- Sampler certification;

- Sampler operation;
- Laboratory analytical procedures;
- Quality assurance audit materials, methods, and results.

Criteria for selection of the whole-air canister method include increased sensitivity, temperature stability, no sample breakthrough or artifact formation (as found when using Tenax sampling tubes), and cost effectiveness. Canister sampling equipment was available on site and no new purchases were needed. An additional advantage to the canister method includes permitting multiple analytical runs using the same sample. For further details on field sampling and laboratory requirements the reader is referred the EPA method document, and the Site Statement of Work (SOW) issued for the procurement of TO-14 laboratory services. The subcontract laboratory for this project is Southwest Research Institute located in San Antonio, Texas. Field sampling at the Site began in June of 1995 at all five sites, on a once every sixth-day schedule. A 24-hour sampling period was selected, with the sampling timer set to operate from midnight to midnight on the scheduled sample date. Due to the Site transition to a new team of contractors, and the associated reorganization of personnel and funding, the VOC sampling project was suspended at the end of July until November, 1995. Budget restrictions required adjusting the collection schedule to roughly once every 12th day with the sampler operating for 24 hours.

Samples are shipped by overnight delivery service to the laboratory within 48 hours. Preliminary analytical results are available within seven to eight days for initial review. Reruns of samples can be requested at this time if required. The final analytical data package is typically returned within three weeks of sample collection. Priority analytical services are available for faster turn around time, if required, but are not used for this stage of the verification monitoring program. Field collection and sample handling protocols are found in procedure No. 4-U52-ENV-AQ.17, which is maintained in manual No. 5-21000-OPS-AP, Volume VI: Air. Collection of samples is a service provided by the Analytical Projects Office based in Building 881. Samples are shipped off site via subcontracted services under contract to Rocky Mountain Remediation Services (RMRS), Surface Water division.

Completion of the baseline project is expected by September, 1996. A full data analysis with summary reports can be completed after that time. The finalized VOC data set will allow the development of action limits and preprogrammed responses to be used for verification monitoring programs that may be needed to characterize air releases during D&D operations.

4.3 Preliminary Data Indications

Ninety-five canister samples have been collected to date, with 4% of the samples being voided due to equipment failure or technician error. Sampler S-116 was twice damaged due to high winds, and sampler S-301 experienced a failed sample pump.

All analysis to date indicate values at or below minimum detection limits except for acetone, toluene, and benzene. The concentrations of benzene are consistent with values found in the metro Denver airshed (5,7); Benzene is a common constituent of automobile exhaust. The elevated concentrations of acetone and toluene, although not inconsistent with those found in many metropolitan areas, are only being measured at significant levels at the downwind sampling locations [Table 1]. The annual data report at the completion of the project will evaluate the statistical significance of these preliminary findings.

Data are reported in units of parts per billion (ppb), and a preliminary summary is found in **Table 4-1 Preliminary Ambient VOC Data, Significant Results**. The sample collection efficiency goal for the project is ^{3} 80% data capture from which we would expect a minimum of five valid observations per quarter, which is obtainable from the yearly schedule considering the change to collecting samples once every two weeks. An external QA/Quality Control (QC) audit of the subcontracted laboratory was conducted in September, 1995 by the Site Analytical Projects Office, and all required parameters of the Statement of Work were met or exceeded. Quality assurance on field activities have been limited to calibrations on each samplers mass flow meter, verification of elapsed time during sample run dates, and cross-training of field technicians. Implementation of field or trip blanks has been scheduled for Spring of 1996. If resources permit, collection of several co-located field samples will be performed during the summer sampling season.

Table 4-1 Preliminary Ambient VOC Data, Significant Results

Compound	CAS No.	Location	Concentration Range, ppb	Mean Concentration, ppb
Acetone	67-64-1	S-008	1 — 55	6.0
Acetone	67-64-1	S-205	ND — 22	3.0
Acetone	67-64-1	S-301	ND — 8	2
Toluene	108-88-3	S-008	ND — 3	0.5
Toluene	108-88-3	S-205	ND — 5	2
Toluene	108-88-3	S-301	ND — 2	1
Benzene	95-63-6	S-008	ND — 1	1
Benzene	95-63-6	S-205	ND — 3	1
Benzene	95-63-6	S-301	ND	ND

* ND = Non Detect
Note: S-104 and S-116 had no detectable VOCs

4.4 Summary

Five ambient air samplers are in operation for the collection of volatile organic compounds within the vicinity of the Rocky Flats industrial area. Samples are collected for one day,(mid-night to mid-night) approximately once every two weeks. Sampling is expected to continue until September of 1996, at which time annual data summaries will be prepared and evaluated. These air quality data will provide the basis for a decision baseline which can be used by program managers to develop action limits and a multimedia decision support system for evaluation of potential emissions from remediation activities within the industrial area. Based on sampling to date, acetone and toluene show results that may be higher than expected background and that may require further investigation.

A final VOC data set will allow the development of action limits and preprogrammed responses to be used for verification monitoring programs that may be needed to characterize air releases during D&D operations.

4.5 References

1 EPA , Air/Superfund National Technical Guidance Study Series, Vol. I, Overview of Air Pathway Assessment for Superfund Sites, Report ASF-1a, November 1992.

2 EPA , Air/Superfund National Technical Guidance Study Series, Vol. II, Estimation of Baseline Air Emissions at Superfund Sites, Report ASF-2a, August 1990

3 EPA , Air/Superfund National Technical Guidance Study Series, Vol. III, Estimation of Air Emissions from Clean-up Activities at Superfund Sites, Report ASF-3, January 1989.

4 EPA, Air/Superfund National Technical Guidance Study Series, Vol. IV, Guidance for Ambient Air Monitoring at Superfund Sites, EPA-450/1-89-004, May 1993.

5 Denver Integrated Environmental Management Project (IEMP), 1987-1988, USEPA, Region VIII, March 1987.

6 Method TO-14 Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA® Passivated Canister Sampling and Gas Chromatography Analysis, USEPA, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, 1988, 1995 and updates.

7 Proceedings of the 1988, 1989, and 1990 EPA/AWMA International Symposium, Measurement of Toxic and Related Air Pollutants, USEPA Report # EPA/9-88-015, #600/9-89-060, and #600/9-90/026.

4.6 Appendix A - Air Quality Monitoring Project VOC Analyte List

Compound	CAS No.
1,1,2-Trichloroethane	79-00-5
1,2-Dichlorobenzene	95-50-1
1,1,2,2-Tetrachloroethane	79-34-5
1,1-Dichloroethane	74-34-3
1,2-Dibromoethane	106-93-4
1,2,4-Trichlorobenzene	120-82-1
1,2-Dichloroethane	107-06-2
2-Butanone	78-93-3
1,3,5-Trimethylbenzene	108-67-8
1,1,1-Trichloroethane	71-55-6
1,2-Dichloropropane	78-87-5
1,2-Dichlorobenzene	541-73-1
Acetone	67-64-1
1,4-Dichlorobenzene	106-46-7
1,2,4-Trimethylbenzene	95-63-6
Benzene	71-43-2
Carbon Tetrachloride	56-23-5
CIS-1,2-Cichloroethene	156-59-4
Methylene Chloride	75-09-2
Chloroform	67-66-3
CIS-1,3-Dichloropropene	10061-02-6
M/P Xylene	1330-20-7
Ethylbenzene	100-41-4
O-Xylene	95-47-6
Trichloroethene	79-0106
Tetrachloroethene	127-18-4
Chlorobenzene	108-90-7
Styrene	100-42-5
Toluene	108-88-3
Vinyl Chloride	75-01-4
Trans-1,3-Dichloropropene	10061-02-5
Hexachlorobutadiene	87-68-3

5. RESPONSE ACTIONS

5.1 Objectives

One of the Industrial Area IM/IRA objectives is to provide mitigative actions, wherever possible, for low level chronic releases. These releases may be detected as off normal events by the Industrial Area monitoring system. The purpose is to provide an early response which has the potential of reducing the environmental impact of such releases before they become compliance problems.

Response actions usually include verification of the release to preclude responses to false positive results, an investigation of potential source areas, notification of release to responsible parties, and development of mitigative recommendations.

Industrial Area IM/IRA monitoring in 1995 identified three areas in which response actions were taken, or were flagged for additional investigation.

5.2 Surface Water Monitoring

Surface water monitoring in the Industrial Area identified two areas in which response actions were initiated. The first involves overflows of the Building 887 Septic Lift Station. Sample location GS 23 is located south of buildings 881 and 887 (Figure 2-1 Surface water). The first overflow was detected on June 17, 1995. This overflow involved 5,000 gallons. Results of sample analyses indicated that the water was high in fecal coliform suggesting that the source of the overflow was the Septic Lift Station in Building 887. A subsequent source investigation confirmed this. A walk down of the building suggested that the overflow was caused by a power outage to the building. Electricity to the Building 887 lift station was disconnected for approximately 10 hours on June 12, 1995 while a new feeder line was installed. Building personnel were notified not to use the facilities, but sometimes there are blowdowns of the air washers at this time of year. In addition, Building 891 was not notified of the shutdown and routine discharges could have occurred from that source.

The actual sources of this flow were not determined. However, based on the presence of fecal coliform, at least some sanitary waste, as well as other miscellaneous flows from the buildings flowed to the Building 887 lift station and overflowed the coffer dam which discharges to a 6 inch pipe on the 881 hillside. There is a lagoon located below the discharge pipe which collected the entire discharge. This connection has been reported previously to the regulators in the Historical Release Report. Based on this information, it was determined that no endangerment to human health or the environment occurred.

To mitigate the potential for recurring overflows of this facility, operational controls were recommended. In the event that maintenance work will result in the potential temporary shut down of the Building 887 lift station, Building 881 management should notify all buildings that have input into the 887 lift station system. Operations in all building that contribute to this system should be curtained to limit the potential for an overflow.

Subsequent overflows of the Building 887 lift station could not all be correlated to electrical power interruptions to Buildings 887 or 881. After a 5,000 gallon overflow was recorded on December 28, 1995, discussions with Building 881 operations personnel were resumed to further investigate potential mitigative actions. Building 881/887 operations are undertaking the replacement and upgrade of the lift station pumps and float actuators. This action should limit the potential for overflows being caused by pump and float malfunctions. In addition, the potential for installing a high level alarm in the lift station sump is being investigated. This would allow building operations personnel the opportunity to manually activate the pumps if there were a malfunction in the actuating mechanism. These actions are being planned for implementation and will provide a "best management practice" approach to minimizing the potential for future overflows.

5.2.1 Gaging Station GS27 Plutonium Source Investigation

The second surface water response action resulted from baseline development monitoring in preparation for the Building 889 D&D project. Surface water samplers GS27 and GS28 (Figure 2-3) were located at Building 889 sub-basin effluent points. These samplers were installed to establish baseline levels in storm water run-off. High Pu-239,240 and Am-241 activities have been consistently measured in stormwater runoff sampled at GS27. Therefore, it was prudent to attempt to identify the source of the actinide contamination in the small (less than 1 acre) drainage area. Potential sources in the GS27 drainage area are:

- Cargo containers containing radioactive waste.
- Building 884 waste storage facility.
- Building 889 Radiologically Controlled Area.
- Two process waste line valve vaults located west of Building 889.
- Soil contamination.

Previous investigations in the GS27 drainage area have shown very little Pu-239,240 and Am-241 activity in the soils (OU12 Phase I RFI, EG&G, 1995). These investigations show approximately 3 pCi/gram Pu-239,240 in the soils upgradient from GS27. FIDLER in-situ radiation surveys in the area do not reveal any areas of unusual soil contamination. Therefore, locating the source of actinide contamination in the GS27 drainage area is complex.

The IA IM/IRA staff hypothesized that the actinides could be attached to fine, easily transported particulates that are eroded from the surficial materials in the drainage and then redeposited in a drainage gutter located south of Building 884 approximately 25 feet from GS27. The sediments in the gutter were thought to be a secondary deposit of the contaminated material which was then flushed to GS27 during intense storm events. Three composite sediment samples were obtained from the gutter; one from the southeast end of Building 884, one from the southwest end of Building 884, and one from the southwest corner of Building 884 to GS27 (Figure #). Samples were collected per Site sediment sampling standard operating procedures; using a stainless steel scoop to scrape the top centimeter of sediment at approximately three foot intervals along the

gutter. Fine material was preferentially collected; taking care to exclude large gravel-size materials. Photographs of the material and the locations of each sampling site are available on file (Rocky Flats Photography Department negative numbers: 48462-17 to 48462-27).

The samples were submitted to the Building 881 General Labs for analysis of Pu-239,240, Am-241, U-233,234, and U-238 by alpha spectrometry. The results of these analyses are shown in **Table 5-1 Building 884 - GS27 Lab Analysis Results**

Table 5-1 Building 884 - GS27 Lab Analysis Results

Sample Number	U-233,234 (pCi/g)	U-238 (pCi/g)	Pu-239,240 (pCi/g)	Am-241 (pCi/g)
SD01001JE	0.844 +/- 0.100	0.897 +/- 0.102	6.602 +/- 0.263	1.269 +/- 0.133
SD01002JE	1.085 +/- 0.113	1.224 +/- 0.121	5.717 +/- 0.248	1.833 +/- 0.175
SD01003JE	1.575 +/- 0.132	1.239 +/- 0.115	5.672 +/- 0.232	1.453 +/- 0.150
SD01003JE-DUPLICATE	1.267 +/- 0.127	1.162 +/- 0.124	5.523 +/- 0.231	1.850 +/- 0.200

The data in **Table 5-1 Building 884 - GS27 Lab Analysis Results** do not show enough actinide content to explain the high Pu-239,240 and Am-241 activities measured in GS27 runoff samples (90 pCi/L Pu-239,240). However, the Pu-239,240 activity measured in these sediment samples are about double the activity measured in soils upgradient from the gutter; supporting the hypothesis that fine materials can be eroded and redeposited to form an enriched deposit of contaminated material. Efforts to identify the source(s) of actinide contamination in stormwater runoff will continue in the GS27 drainage area under the IA IM/IRA.

In addition, the storage containers located south and east of building 884 will be further investigated as possible sources in conjunction with the installation of physical measures to control non-point sources. Silt fences are currently planned to be installed up stream of GS 27 and GS 28 to capture potentially contaminated suspended material. Sample results from these stations will indicate whether or not the control measures are effective in reducing the surface actinide load.

5.3 Groundwater Monitoring

No response actions under the IA IM/IRA were taken for groundwater. Contamination identified by IA IM/IRA wells has established baseline levels for the interior of the Industrial Area and is being addressed by the Sitewide Groundwater Strategy and the Action Level Standards document which is an Appendix to the Rocky Flats Clean-up Agreement.

5.4 Air Monitoring

As discussed in the Air Monitoring section, elevated concentrations of acetone and toluene were detected at downwind sampling locations. These constituents are not inconsistent with those found in many metropolitan areas but are being measured at potentially significant levels.

Additional data will be collected to increase the statistical significance of the data set. Once the data set is complete, the data will be evaluated and source area investigation may be initiated. Mitigative actions will be implemented if appropriate.

5.5 Appendix A - Building 884 Area Radiological Results

Gamma

RADIOLOGICAL OPERATIONS GAMMA SURVEY

CONTROL NO. _____

Taken by: Dunbar Emp. # [redacted] Reviewed by:

Taken by: _____ Emp. # _____ Rad Ops Forman A.E. Glass Emp. # [redacted]

Taken by: _____ Emp. # _____ Name/Organization _____ Emp. # _____

Date: 7-24-95 Building: NA

Time: 0900 Room #: NA

Shift: Day

Survey Description: Survey Ground around Bldg 884.

* Note position on map, numbers denote location of readings.

BICRON FIDLER

Mfg: FIDLER
Model: Bicron
Serial #: 4531P
Date Perf. Ck: ~~12-14-94~~ 7-24-95
Date Calib'd: 12-14-94
Cal. Due Date: 12-95

FIDLEI

Post-it® Fax Note 7671 | Date | # of pages ▶
To SPENCE | From
Co./Dept. | Co.
Phone # | Phone #
Fax # | Fax #

	BKG	c/m METER	SCALER	AREA POSTED (Y/N)
#1		2700	-	
*1.	2724	2018		
2.	-1-	2000	1983	
3.	-2-	2200	2206	
4.	-3-	2300	2212	
#25.	-4-	7000	6834	
*6.	3048	2000		
7.	-1-	2200	2182	
8.	-2-	3200	2230	
9.	-3-	2300	3317	
#3 10.	-4-	2300	2445	
*11.	2173	2200		
12.	-1-	1900	1899	
13.	-2-	2300	2139	
14.	-3-	2100	2072	
#4 15.	-4-	2300	2222	
*16.	2196	2200		
17.	-1-	1400	1358	
18.	-2-	2400	2332	
19.	-3-	1900	1930	
#5 20.	-4-	2000	1901	
*21.	2389	2400		
22.	-1-	2300	2263	

Comments - Swaping ground between Valve Vault 3 To 4
3000 to 5000 cpm
#12 Between Valve Vault 3 to 4 7 readings
#17 Southwest corner Bldg 884 To Solar Panal Ditch 7 readings

RADIOLOGICAL OPERATIONS GAMMA SURVEY

CONTROL NO. _____

	BKG	c/m METER	SCALER	AREA POSTED (Y/N)
23.	-2-	2500	2582	
24.	-3-	2200	2141	
6 25.	-4-	2400	2469	
*26.	2278	2300		
27.	-1-	2500	2465	
28.	-2-	2300	2242	
29.	-3-	2500	2495	
30.	-4-	2500	2631	
*31.	2659	2600		
32.	-1-	2100	2104	
33.	-2-	1900	1834	
34.	-3-	2000	2023	
#8 35.	-4-	2300	2207	
*36.	2226	3300		
37.	-1-	2600	1941	
38.	-2-	3300	2361	
39.	-3-	2300	2209	
#9 40.	-4-	2500	2401	
*41.	2118	2200		
42.	-1-	2100	2109	
43.	-2-	2200	2144	
44.	-3-	2300	2210	
#10 45.	-4-	2200	2146	
*46.	1294	2300		
47.	-1-	2200	2194	
48.	-2-	2100	2089	
49.	-3-	2200	2129	
#11	50.	-4-	2300	2320	
*51.	2249	2400		
52.	-1-	3400	3330	
53.	-2-	4200	4042	
54.	-3-	4900	4804	
55.	-4-	6500	6366	
56.	-5-	7600	7577	
#12 57.	-6-	7500	7518	
*58.	2446	3500		
59.	-1-	3400	2511	
60.	-2-	2100	2930	
61.	-3-	2700	2655	
62.	-4-	2900	2765	
63.	-5-	3700	3500	
64.	-6-	4600	4562	
#13 65.	-7-	4300	4219	
*66.	2469	2500		
67.	-1-	2600	2478	
68.	-2-	2900	2798	
69.	-3-	2700	2609	
#14 70.	-4-	2800	2707	
*71.	2263	2400		
72.	-1-	3700	3673	
73.	-2-	3300	3301	
74.	-3-	5400	5233	
#15 75.	-4-	7600	7522	
*76.	2462	2500		

RADIOLOGICAL OPERATIONS
GAMMA SURVEY

CONTROL #_____

	BKG	c/m METER	SCALER	AREA POSTED Y/N		BKG	c/m METER	SCALER	AREA POSTED Y/N
77	-1-	2700	2659		115				
78	-2-	3200	2988		116				
79	-3-	3100	2959		117				
#16 80	-4-	2900	2833		118				
*81					118				
82	2396	2400	3702 04		119				
83	-1-	3800	3839		120				
84	-2-	7800	7739		121				
85	-3-	4400	4445		122				
#17 86	-4-	3200	3095		123				
*87	2548	2500			123				
88	-1-	3300	3350		124				
89	-2-	3700	3736		125				
90	-3-	3600	3511		126				
91	-4-	3500	3369		127				
92	-5-	2900	2936		128				
93	-6-	3000	2982		129				
94	-7-	2800	2748		129				
95					130				
96					131				
97					132				
98					133				
99					134				
100					134				
101					135				
102					136				
103					137				
104					138				
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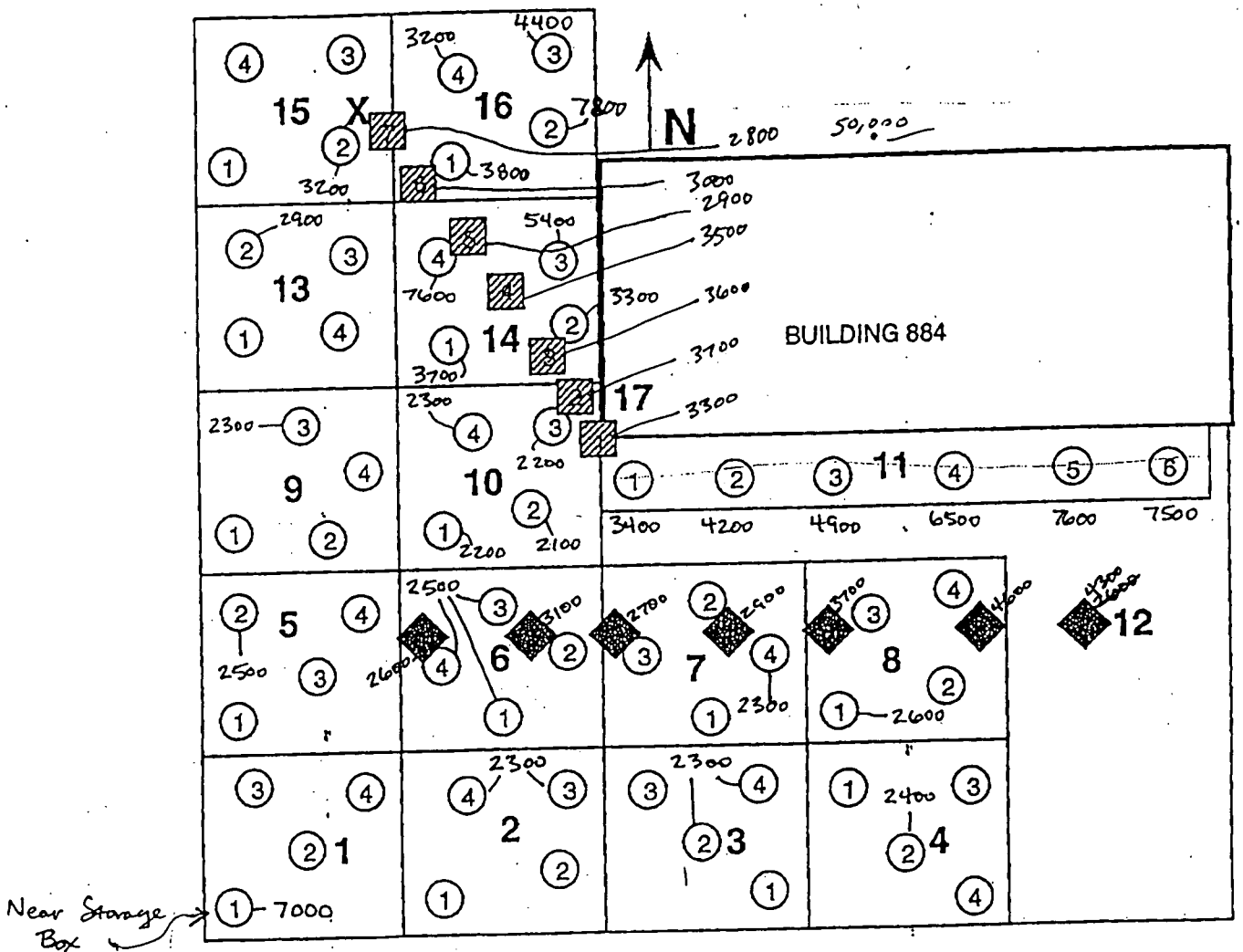
114					146				



#12 - ◆ - POINTS TAKEN FROM VALVE VAULT 3 TO VALVE VAULT 4

#17 - ▨ - POINTS TAKEN FROM BUILDING 884 CORNER TO SOLAR PANEL

X SOLAR PANEL

RADIOLOGICAL OPERATIONS GAMMA SURVEY

CONTROL NO. _____

Taken by: [redacted] Emp. [redacted] Reviewed by:

Taken by: [redacted] Emp. [redacted] Rad Ops Forman [redacted] Emp. # [redacted]

Taken by: _____ Emp. # _____ Name/Organization _____ Emp. # _____

Date: 8-9-95 Building: 884

Time: 0830 Room #: _____

Shift: Days

Survey Description: Survey ground around Building 884 4 Readings per location

BICRON FILDER

Mfg:	FIDLER	FIDLER	FIDLER	FIDLER	FIDLER
Model:	BICRON				
Serial #:	A5313				
Date Perf. Ck:	8-9-95				
Date Calib'd:	12-14-94				
Cal. Due Date:	12-95				

	BKG	c/m METER	SCALER	AREA POSTED (Y/N)
#1 1.	4318	4400		N
2.	1	3500	3497	N
3.	2	4000	3947	N
4.	3	3700	3620	N
5.	4	3600	3598	N
#2 6.	4514	4500		N
7.	1	4000	3941	N
8.	2	5000	4749	N
9.	3	4400	4317	N
10.	4	5000	4970	N
#3 11.	5542	5500		N
#3 CONT 12.	1	5300	5294	N
13.	2	6700	6705	N
14.	3	7200	7106	N
15.	4	7000	6914	N
#4 16.	5681	5700		N
17.	1	7700	7665	N
18.	2	8700	8694	N
19.	3	9000	9015	N
20.	4	8900	8912	N
#5 21.	6606	6700		N
22.	1	7000	7033	N

RADIOLOGICAL OPERATIONS
GAMMA SURVEY

CONTROL #_____

	BKG	c/m METER	SCALER	AREA POSTED Y/N
77	1	4200	4117	N
78	2	8000	7921	N
79	3	6000	6062	N
80	4	7500	7415	N
81	7415	7500		N
82	1	6200	6137	N
83	2	6000	5895	N
84	3	8100	8141	N
85	4	5000	5094	N
~~86~~	4750	4800		N
87	1	5200	5135	N
88	2	5800	5734	N
89	3	5500	5334	N
90	4	5500	5552	N
~~91~~	3951	4000		N
92	1	3600	3541	N
93	2	3500	3352	N
94	3	4000	3800	N
95	4	3900	3807	N
~~96~~	3000	3000		N
97	1	2500	2495	N
98	2	2600	2628	N
99	3	2400	2297	N
100	4	2700	2694	N
101	13900	14000		N
102	1	12500	12308	N
103	2	13000	12765	N
104	3	15000	15034	N
105	4	15000	14903	N
~~106~~	17476	17500		N
107	1	21000	20701	N
108	2	23000	22856	N
109	3	22000	22012	N
110	4	20000	20252	N
~~111~~	18533	18500		N
112	1	22000	21293	N
113	2	22000	21382	N
114	3	22000	22401	N

	#23 cont. BKG	c/m METER	SCALER	AREA POSTED Y/N
115	4	26000	25533	N
116	5	29000	28346	N
117	6	29000	28303	N
118	7	29000	28697	N
~~#24~~	18904	19000		N
119	1	23000	22703	N
120	2	25000	25083	N
121	3	24000	24015	N
122	4	24000	23052	N
~~#25~~	2185	2200		N
123	1	3500	3359	N
124	2	3500	3343	N
125	3	3100	3102	N
126	4	2900	2842	N
127	5	2900	2807	N
128	6	2400	2285	N
129	7	2300	2322	N
129	8	2300	2284	N
130				
131				
132				
133				
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134				
135				
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137				
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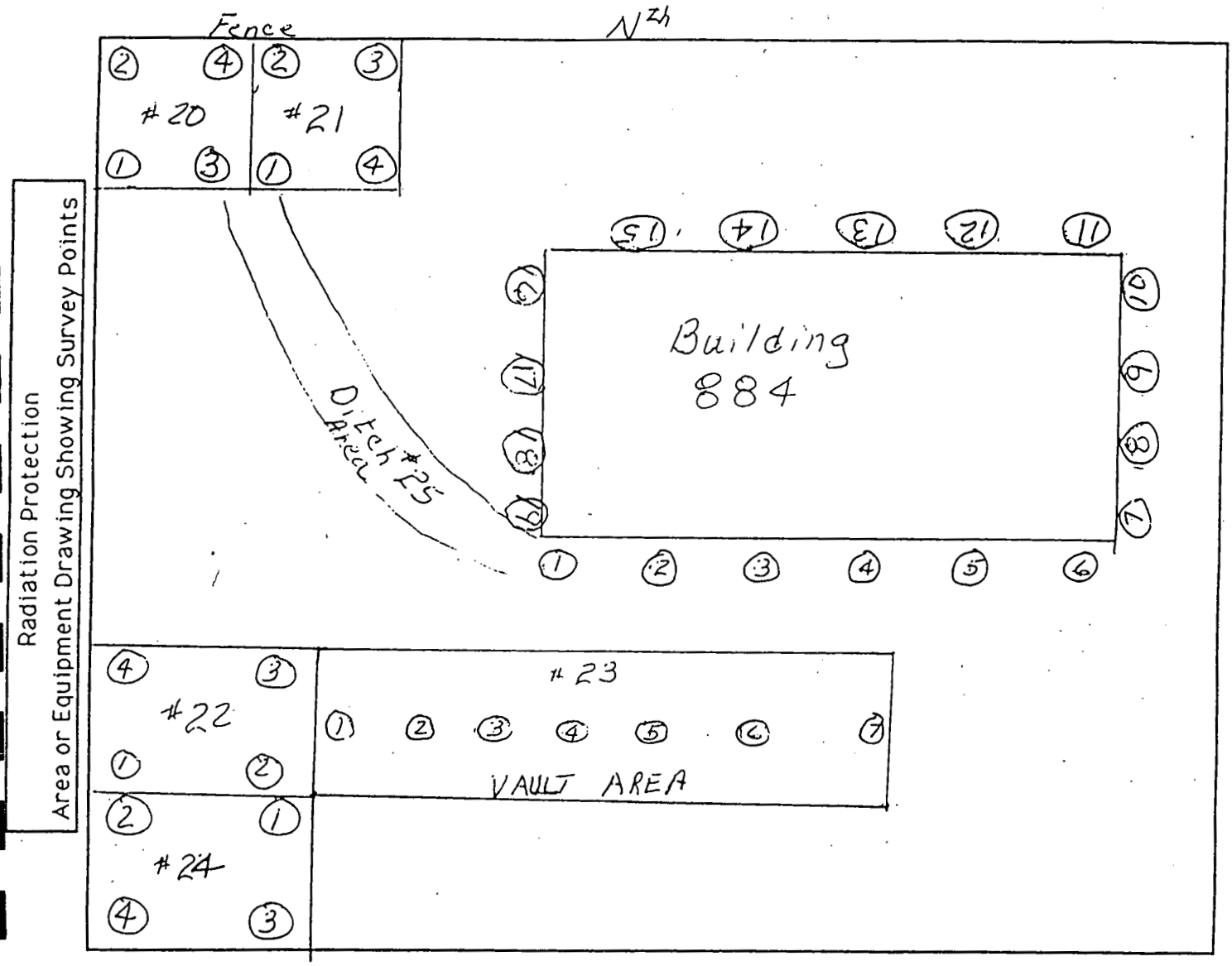
144				
145				
145				
146				

#23 - Vault Area
#25 - Ditch Area

3 of 3


Fence
N
#20
#21
#22
#23
#24
Building
884
Ditch #25
Area
VAULT AREA
Radiation Protection
Area or Equipment Drawing Showing Survey Points

6. SUMMARY OF FUTURE ACTIONS FOR THE INDUSTRIAL AREA IM/IRA

6.1 Objectives

One objective of the Industrial Area IM/IRA is to provide a basis for integrating the environmental monitoring of each media within the Industrial Area. While this objective is being met, its implementation is evolving as part of the Integrated Monitoring Program. This program is evaluating all of the environmental monitoring to establish and maintain the most efficient sitewide monitoring program possible.

6.2 Surface Water Monitoring

Surface water monitoring will continue at the present locations except at locations where enough information is known to warrant a curtailment of monitoring activities. An example would be location GS23. Samples from this location are known to come from the Building 887 lift station overflows. Monitoring at this location will only include flow measurements to alert building personnel of an overflow condition. Samples will not be taken because of the consistency of previous results. The automatic sampler will be relocated to provide characterization and monitoring in a area where transition activities have the potential to impact the environment.

Monitoring will begin in March of 1996 at locations in the Central Avenue ditch in preparation for D&D of the Fuel Oil tanks located at 7th Street and Central Avenue. Additional stations may be installed at other locations in the Industrial Area if transition activities warrant their installation.

Response actions will continue for the Building 887 lift station, and Building 884/889 D&D areas. Removal actions may be initiated if sample results more clearly define the source area near Building 884.

6.3 Groundwater Monitoring

Groundwater monitoring will continue within the industrial area and five additional monitoring wells will be installed to monitor potential migration pathways from the Industrial Area. These wells are proposed in the IM/IRA Decision Document and will fulfill the actions proposed in this document. The five wells will be integrated with the overall groundwater monitoring program, and baseline will be established for these locations.

6.4 Air Monitoring

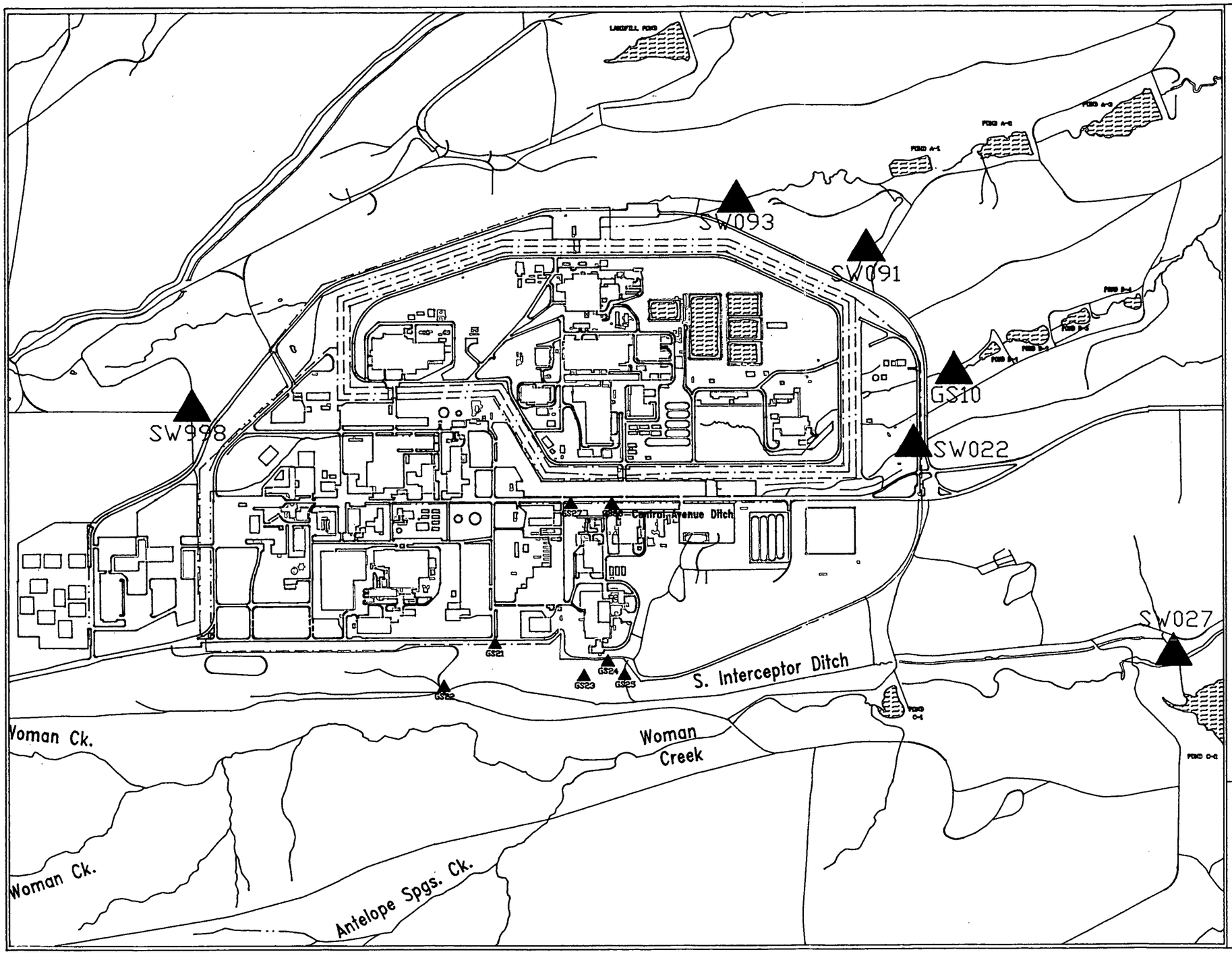
Air monitoring will continue until enough data is collected to establish a baseline. Elevated samples of acetone and toluene will be evaluated to determine if they represent an emission. After the VOC baseline is established for the Industrial Area, VOC monitoring may become more specific to the transition activity and location in the Industrial Area.

6.5 Summary

In less than a full year of implementation, the Industrial Area IM/IRA has identified several areas that could have low level, chronic impacts on the environment. Response actions have targeted low cost, easy implementation remedies that could result in incremental reductions of the Industrial Area contaminant load. It is anticipated that as IM/IRA monitoring continues, additional areas will be identified and characterized that will warrant further mitigative actions. Through the process of monitoring and response actions, the IM/IRA is achieving its goal of reducing the potential for environmental releases, and providing a safety net to protect the public and the environment.

7. ACRONYMS, INITIALISMS, ABBREVIATIONS AND UNITS OF MEASURE

ac	Acres
Am	Americium
APEN	Air Pollution Emission Notice
CDPHE	Colorado Department of Public Health and Environment
CFS	Cubic Feet per Second
CMP	Corrugated Metal Pipe
D&D	Decontamination and Decommissioning
EPA	Environmental Protection Agency
FB	Field Bank
IA	Industrial Area
IAG	Inter-Agency Agreement
IEMP	Integrated Environmental Management Project
IM/IRA	Interim Measures/Interim Remedial Actions
LCL	Lower Control Limit
LR	Lab Replicate
MAX	Maximum
MCL	Maximum Control Limit
mg/l	Milligram per liter
Mi^2	Square Miles
MIN	Minimum
MS	Matrix Spike
MSD	Matrix Spike Duplicate
pCi/g	Picocuries per gram
pCi/l	Picocuries per liter
Pu	Plutonium
QC	Quality Control
RFETS	Rocky Flats Environmental Technology Site
RNS	Rinsate
SID	South Interceptor Ditch
Sq. Cm	Square Centimeter
SVOC	Semi- Volatile Organic Compound
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
UCL	Upper Control Limit
ug/l	Microgram per liter
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound



LEGEND

- Gaging and Sampling Station
- Streams, Ditches, Drainage Features
- Security Fences
- Paved Roads
- Dirt Roads
- Buildings

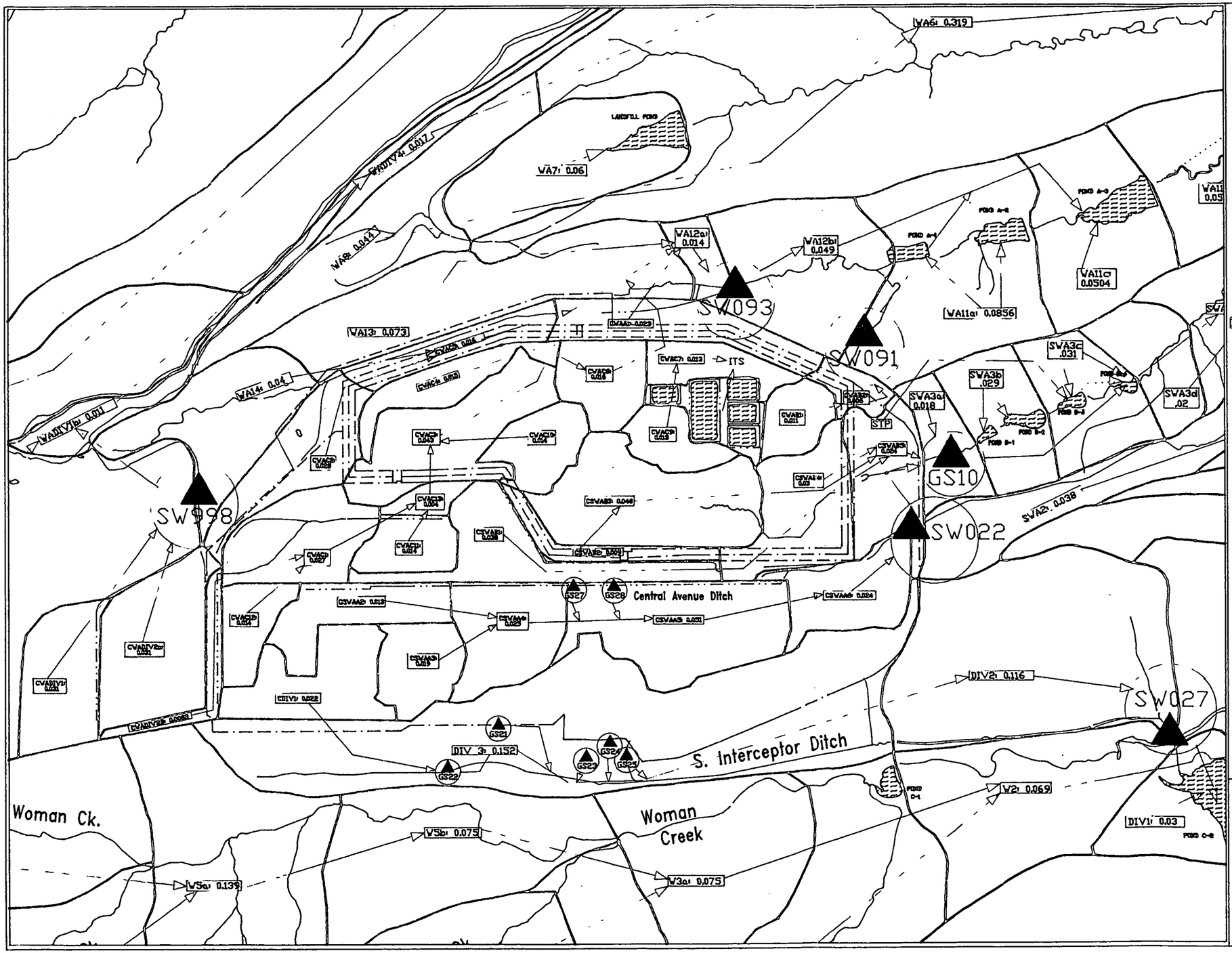
N

FEET

0 784 1568

Figure 2-1

RFETS
Industrial Area IM/IRA
Gaging Station Network:
Surface Water
Verification Monitoring
Locations



LEGEND

- Gaging and Sampling Station
- Streams, Ditches, Drainage Features
- Security Fences
- Basin Boundaries
- ID: AREA Basin Areas (sq. mi.)
- Natural Discharge
- Controlled Transfers and Discharges

N

FEET

0 788 1576

Figure 2-2
RFETS
Industrial Area IM/IRA
Gaging Station Network:
Surface Water
Routing Diagram

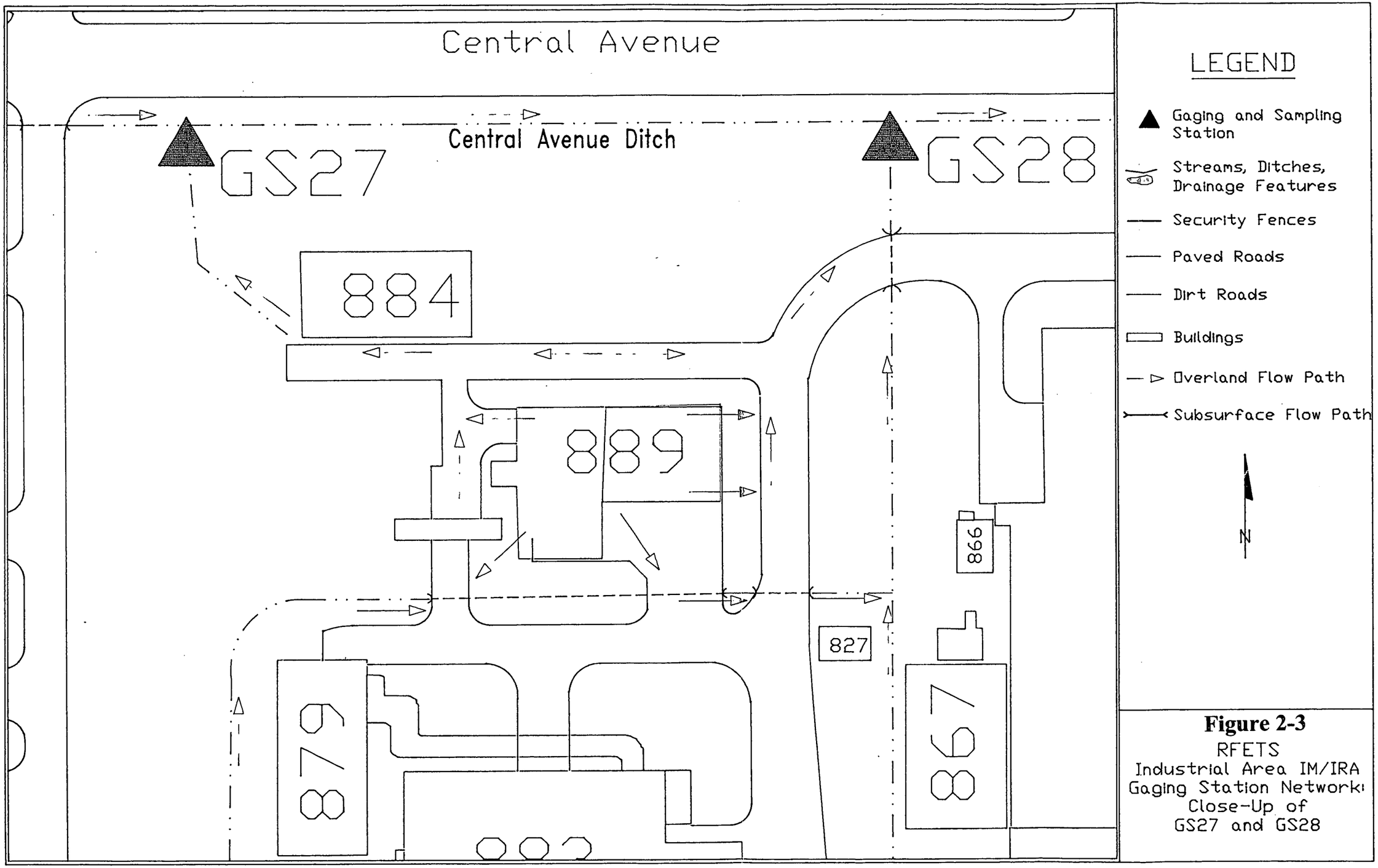


Figure 2-3
RFETS
Industrial Area IM/IRA
Gaging Station Network
Close-Up of
GS27 and GS28

New Industrial Area Wells
With Composite Plume Extent

Contamination extent boundaries represent groundwater sampling results for TCE, PCE, CCl4, and VC.

LEGEND

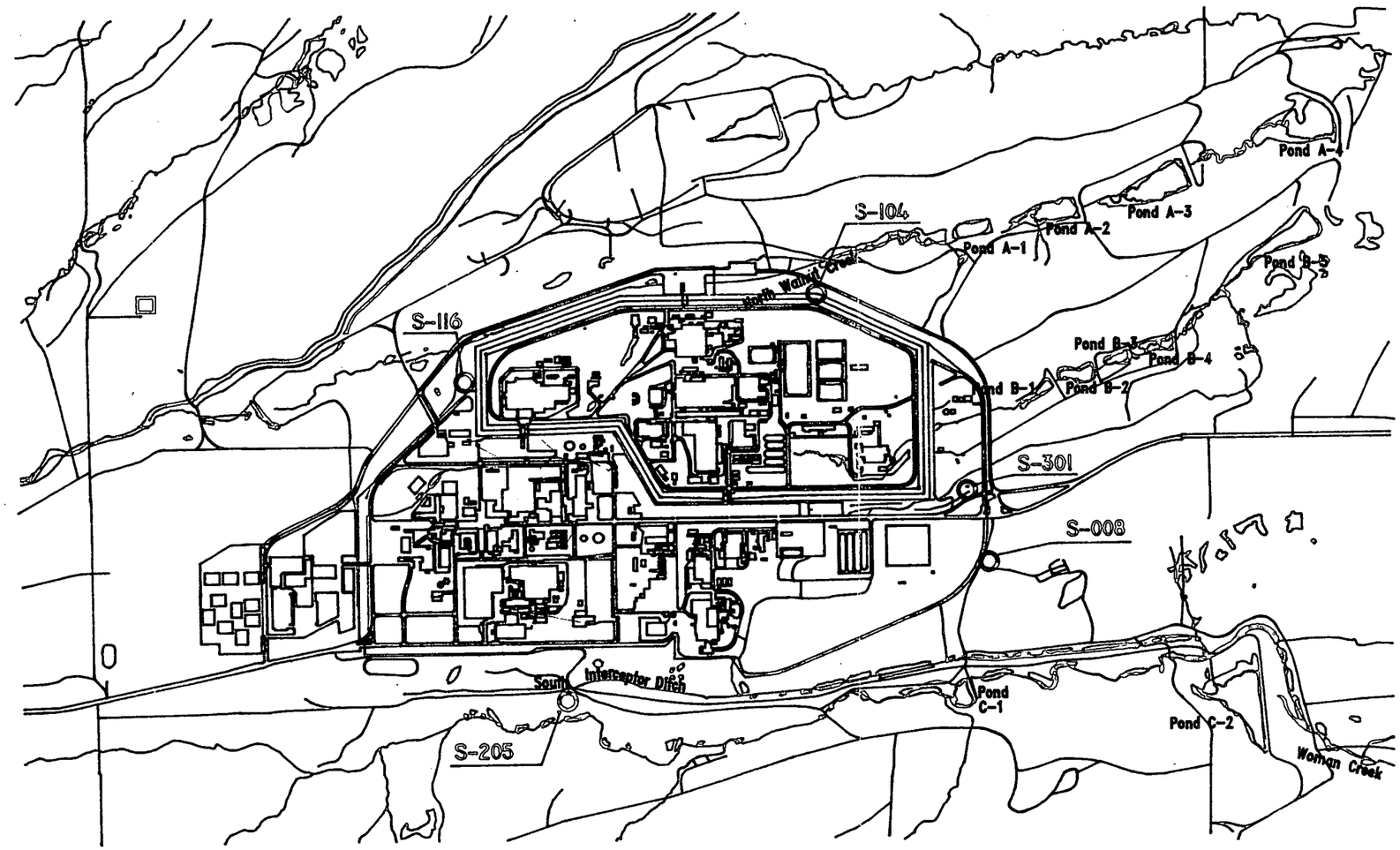
- IMIRA Wells
- Existing Monitoring Well
- Surficial Unit Groundwater Contour
- Groundwater Flow Direction
- Surface Drainage
- Buildings
- Suspected VOA Source
- Pavement
- Concentrations > 100 X MCLs
- Concentrations > MCLs

N

200 0 200 400 800 800 Feet

Figure 3-1

March 1, 1996



U.S. DEPARTMENT OF ENERGY

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

INDUSTRIAL AREA IM/IRA

Wetland Areas
Ponds and Lakes
Buildings
Streams and Drainages
Roads and Fences
RFETS Border

VOC AIR MONITORING SITES

Air Samplers–VOC [TO–14 Canisters]

61 Meter Met. Tower

0 250

Figure 4-1

PREPARED BY
SITEWIDE SURFACE WATER RMRS